Kansas Energy Chart Book

Kansas Energy Council

January 2007

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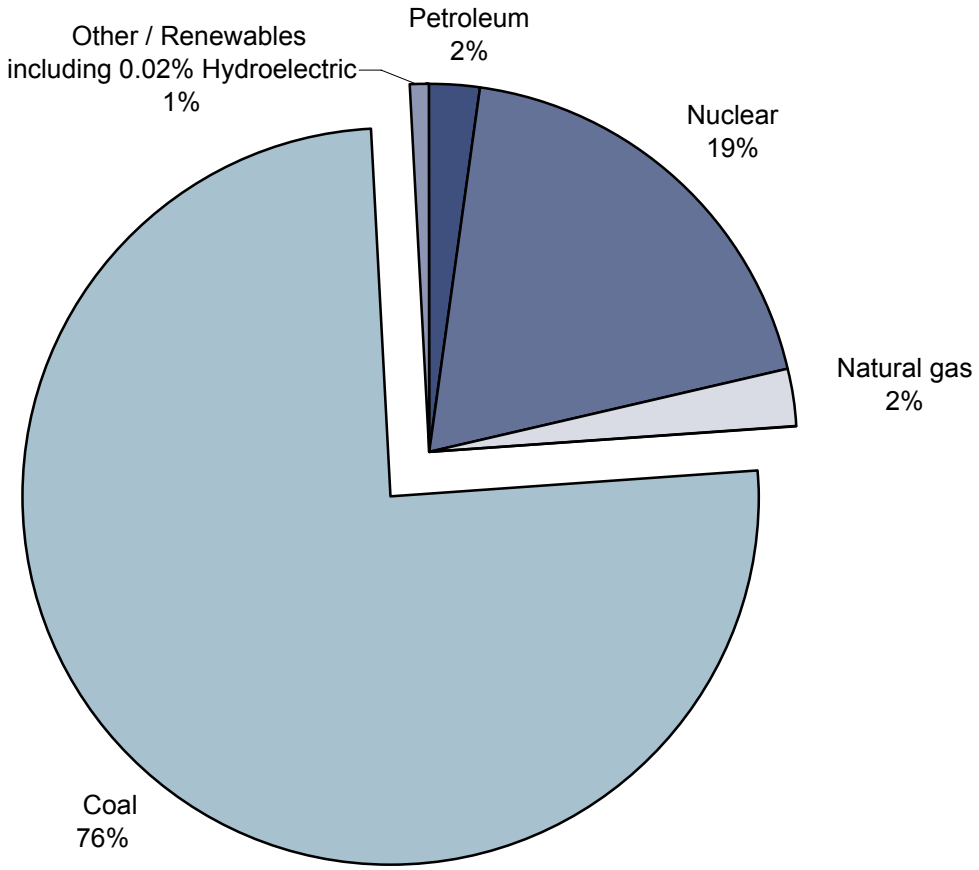
Chapter 3

Fossil Fuels
Coal Gasification
IGCC Coal Power Plant

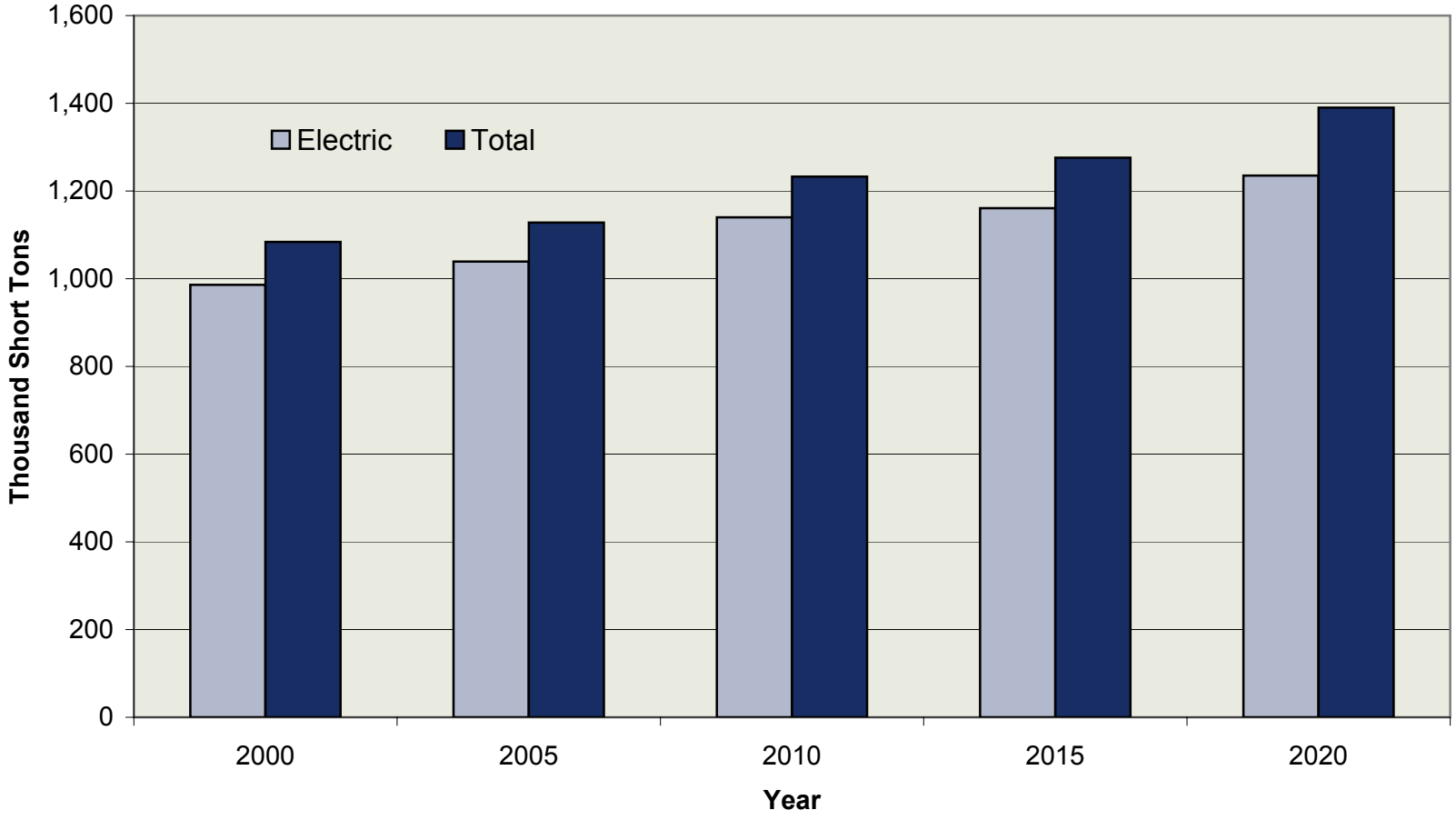
Kansas Net Electrical Generation, 2005



Source: EIA, 2006, Electric Power Monthly, various months, DOE/EIA-0226 (2005-2006/VARIOUS)

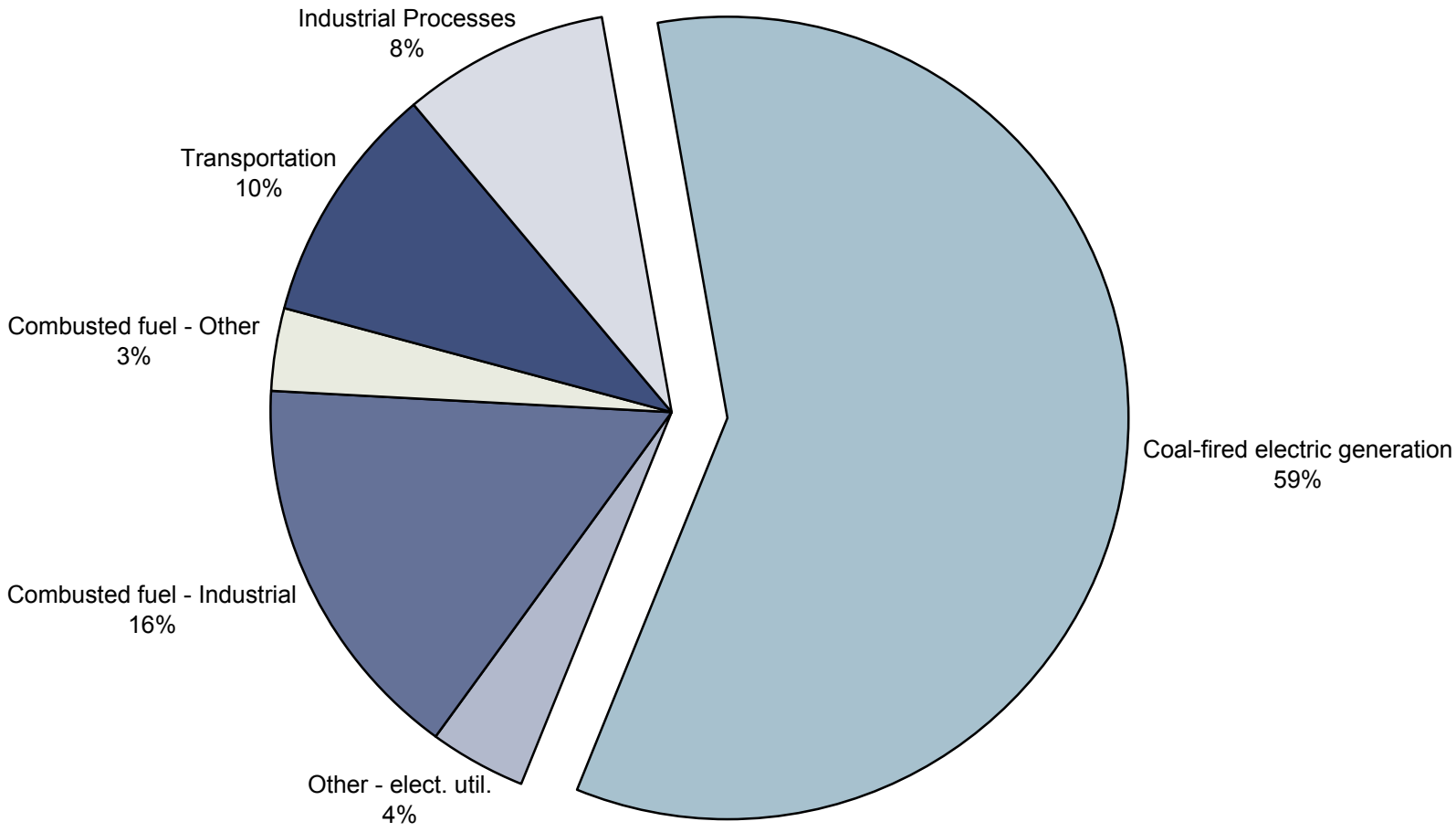
U.S. Coal Consumption, 2000-2020

Total Consumption vs. Consumption for Electric Power Generation



Source: U.S. Department of Energy, Energy Information Administration (Annual Energy Outlook 2006; U.S. Coal Consumption by End-use Sector, 1st Quarter 2006).

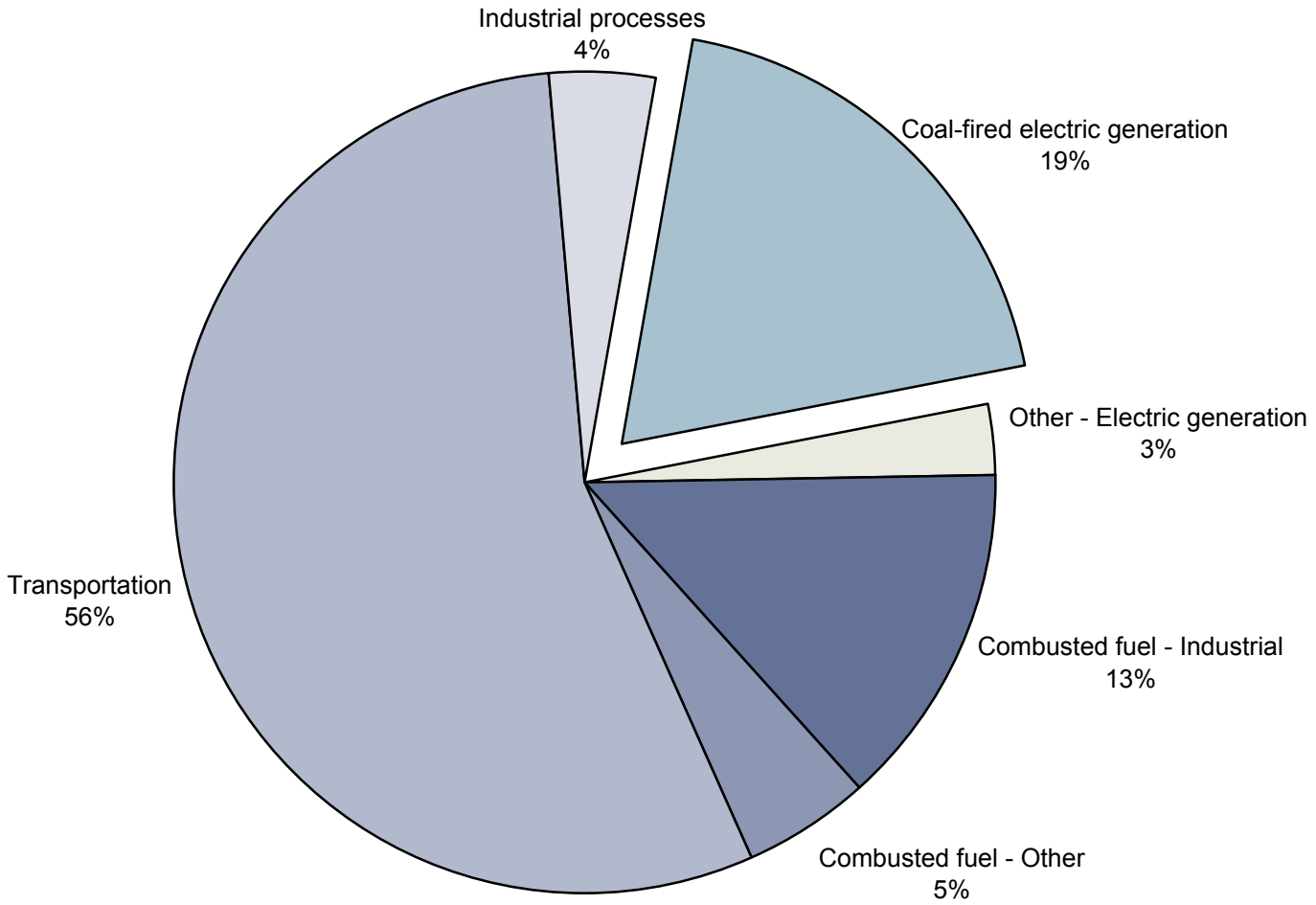
U.S. SO_2 Emissions From Coal-fired Electric Generation, 2000



Kansas Energy Chart Book, Chapter 3

Source: National Air Quality and Emissions Trends Report, 2003, Appendix A, Tables A-4 and A-9.

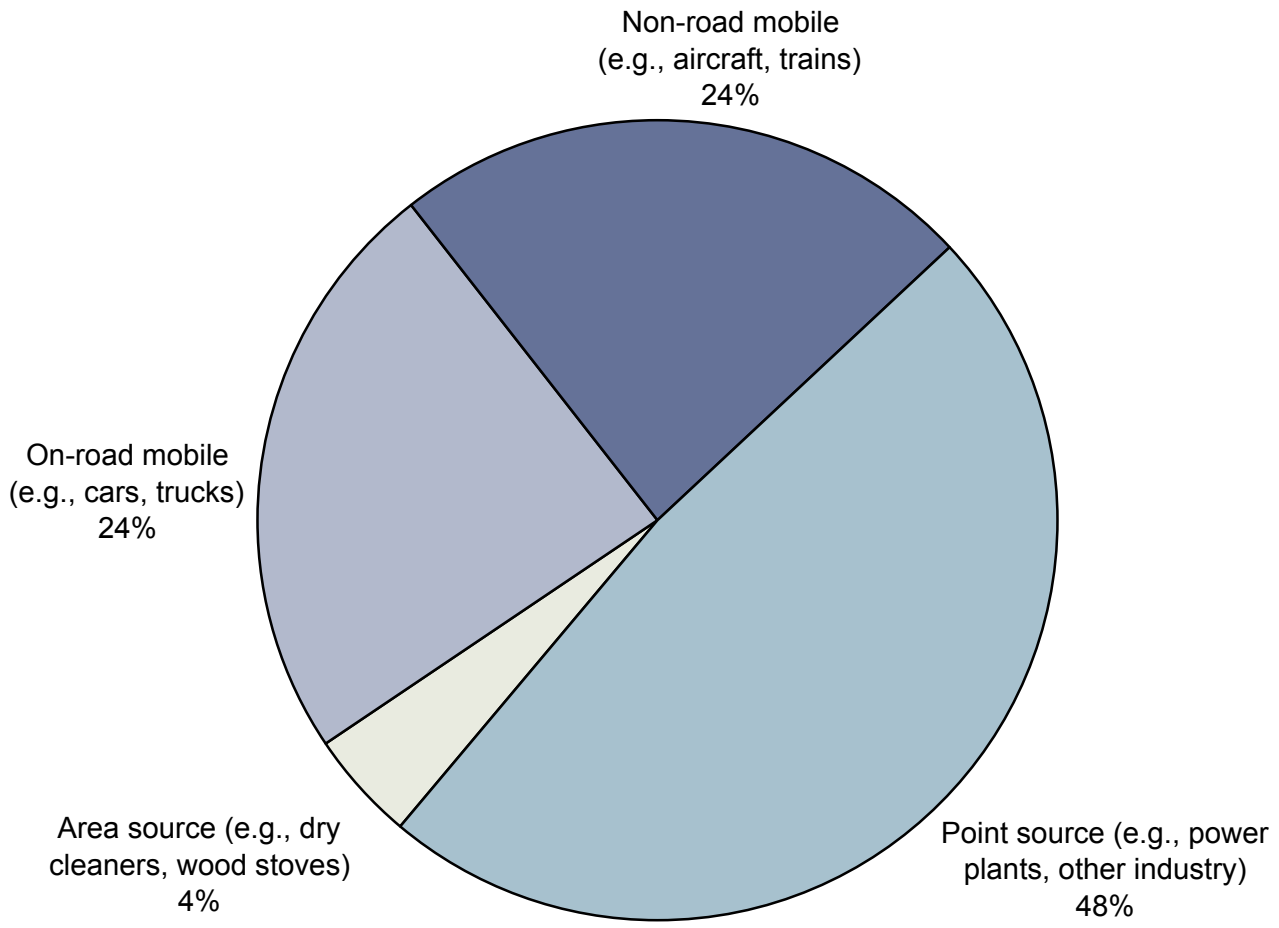
U.S. NO_X Emissions from Coal-fired Electric Generation, 2000



Kansas Energy Chart Book, Chapter 3

Source: National Air Quality and Emissions Trends Report, 2003, Appendix A, Tables A-4 and A-9.

Kansas Total NO_x Emissions by Source, 2002



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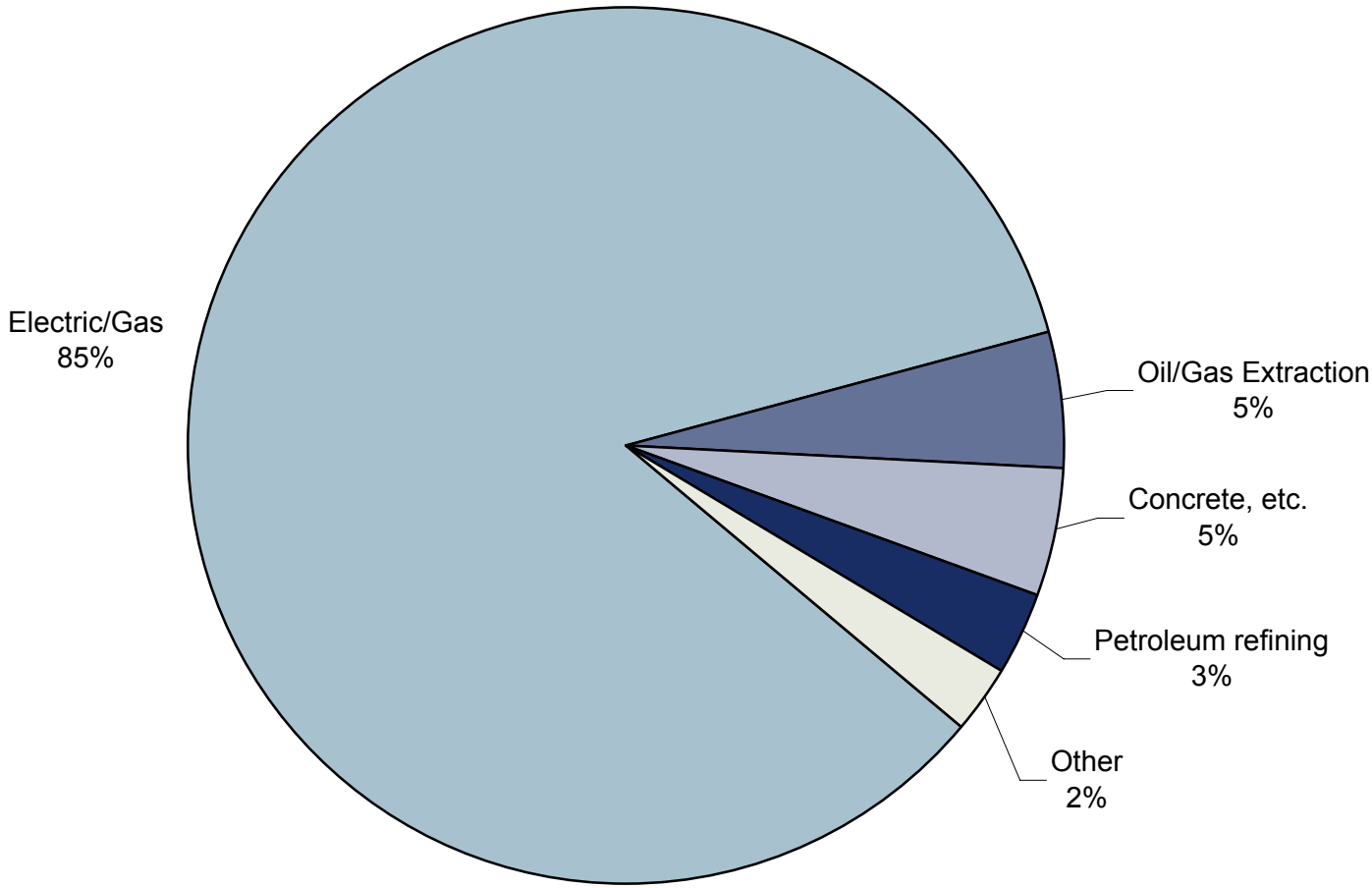
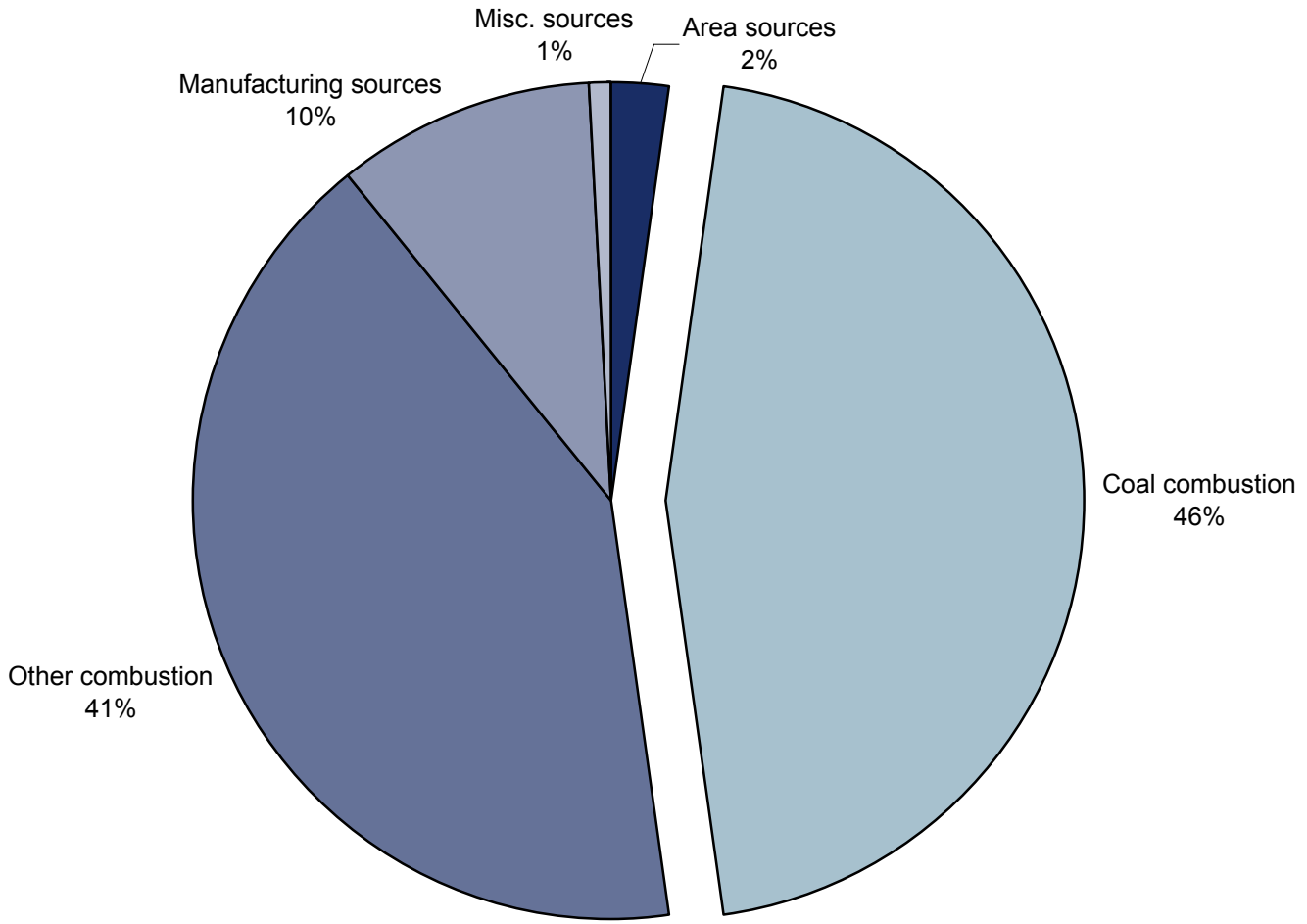
Source: KDHE Bureau of Air and Radiation, based on 2002 National Emissions Inventory (NEI).

Kansas NO_x Point Sources, 2002



Source: KDHE Bureau of Air and Radiation, based on 2002 National Emissions Inventory (NEI).

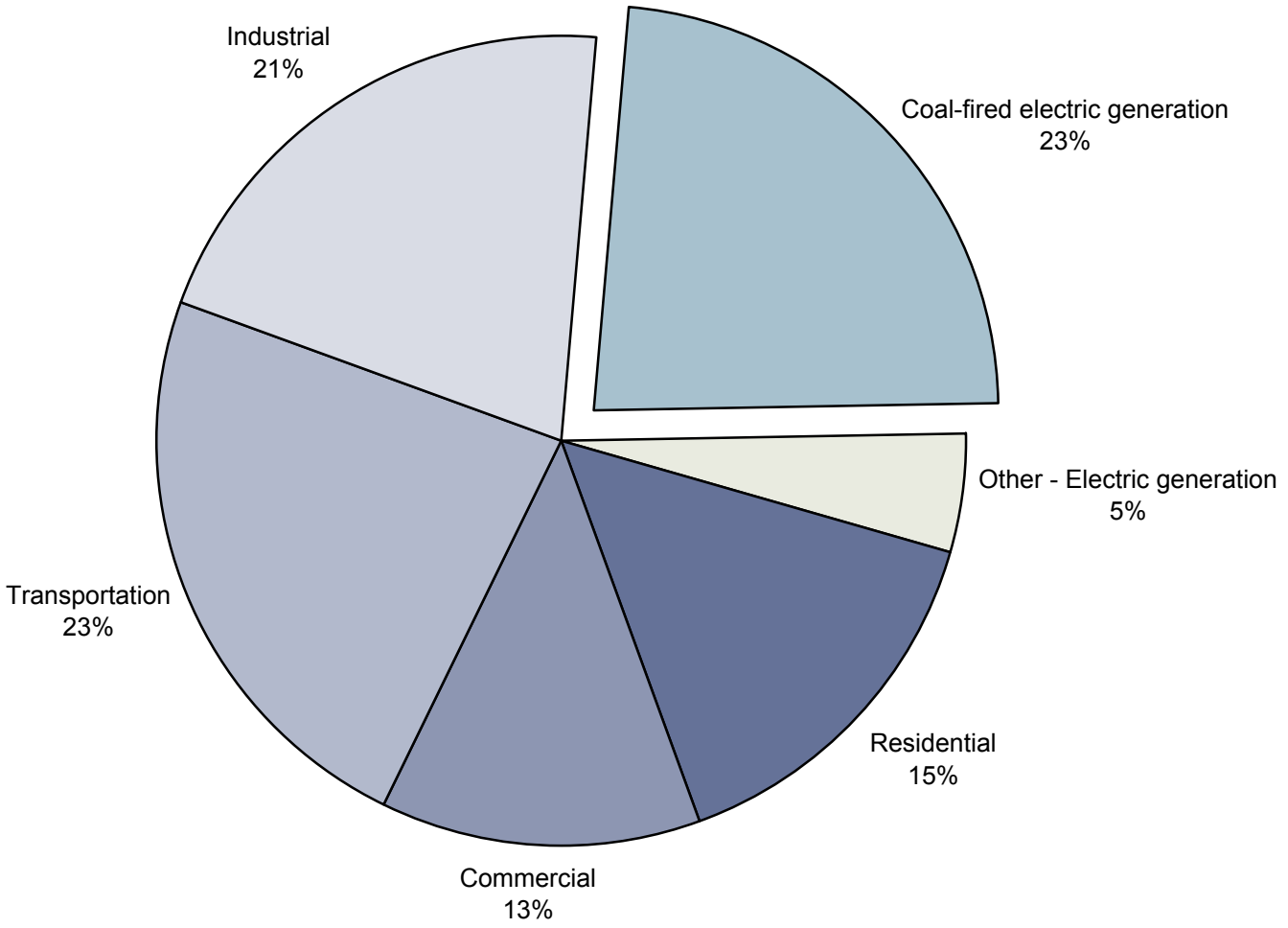
U.S. Mercury Emissions from Coal-fired Electric Generation, 1994-1995



Kansas Energy Chart Book, Chapter 3

Source: Mercury Study Report to Congress, EPA-452/R-97-004, Dec. 1997, Table ES-3

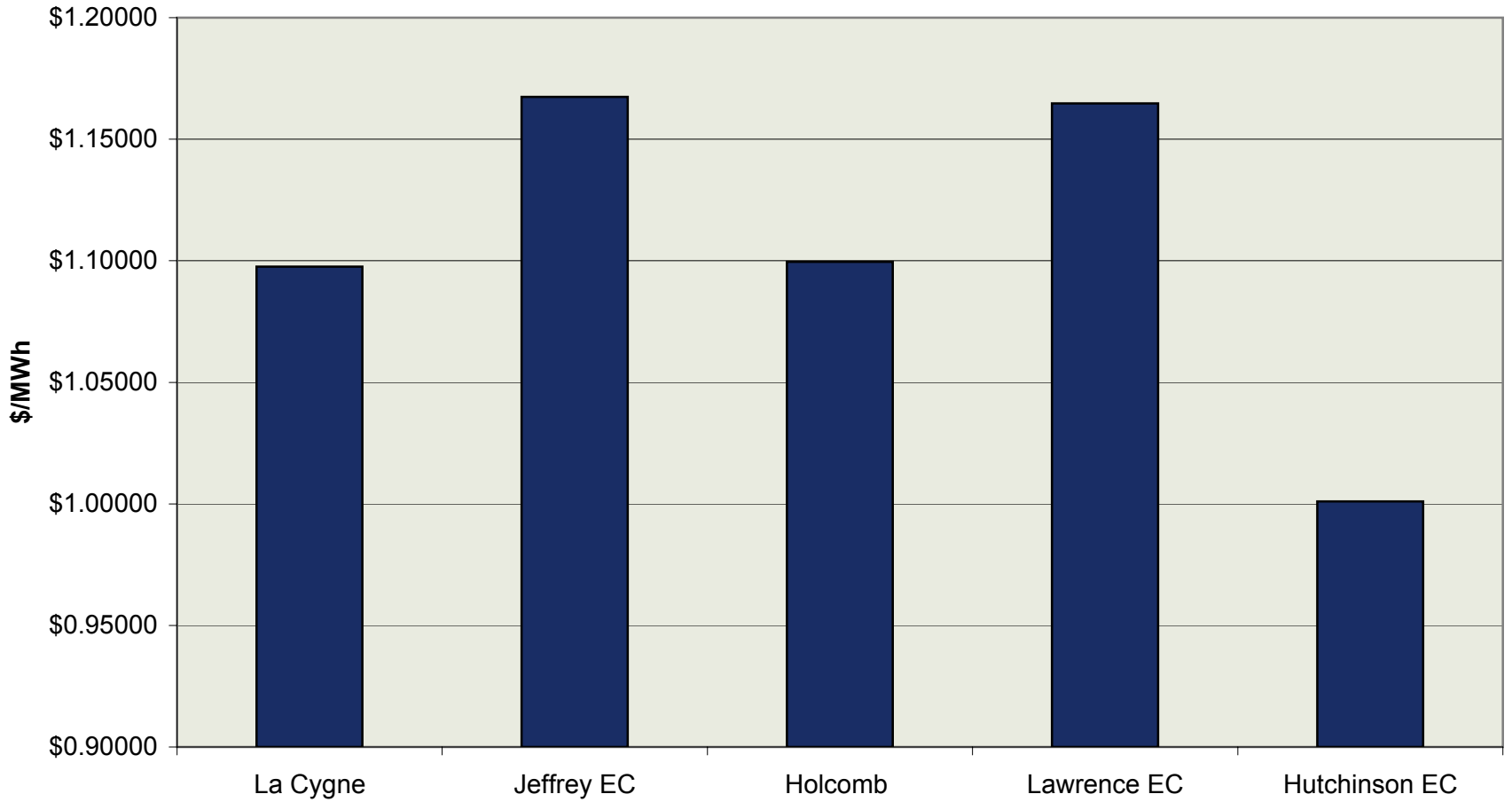
U.S. CO_2 Emissions from Coal-fired Electric Generation, 2003



Kansas Energy Chart Book, Chapter 3

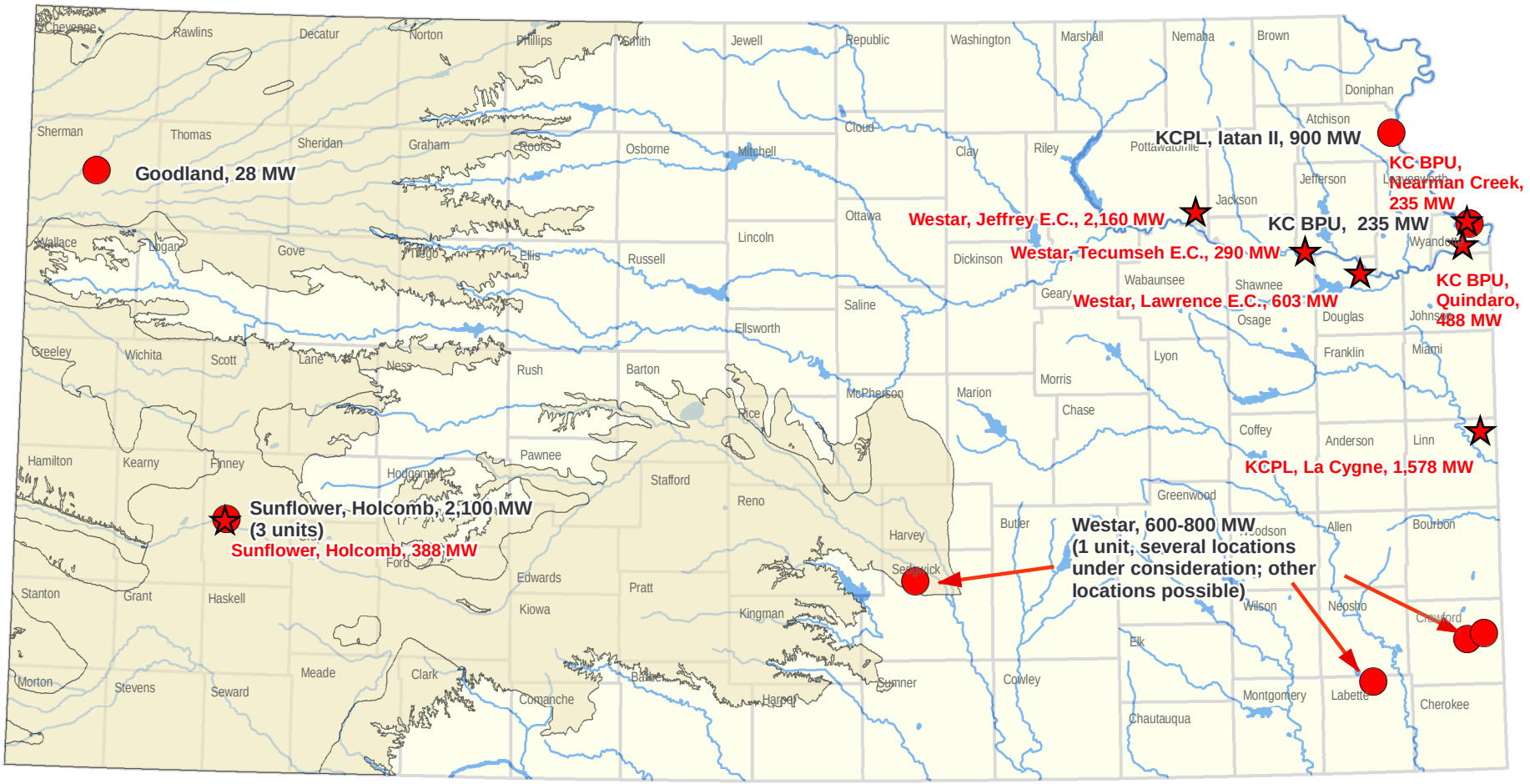
Source: Greenhouse Gases in the United States 2004. DOE/EIA, Table B3.

Projected Impact on Selected Kansas Electric Utilities of $1.00 per Ton Tax on CO_2



Source: Based on 2005 data from EIA-906/920 and EIA-860 databases, Dec. 2005, http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html

Proposed and Existing Coal-fired Power Plants in Kansas, 2006



N

25 12.5 0 25 50 Miles

25 12.5 0 25 50 Kilometers

Projection Information:
Name: Lambert Conformal Conic
Datum: NAD83 Spheroid GRS 1980
Distance Units: meters

Proposed

Existing

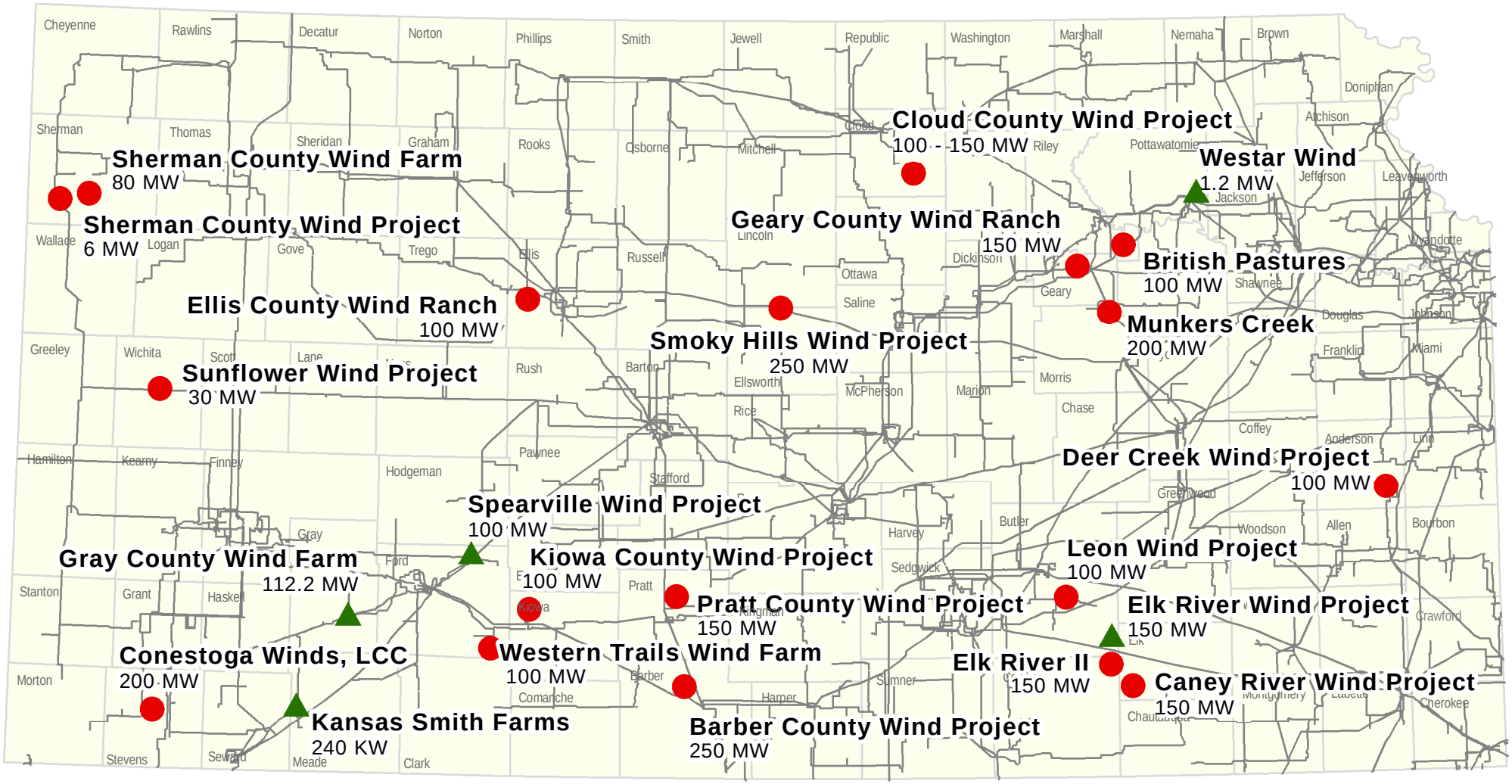
Surface water shown in blue.
Ogallala and other aquifers shown in tan.

Source: Various news accounts and the Kansas Energy Information Network, www.KansasEnergy.org.

Chapter 6

Wind Energy
Commercial and Community Wind

Proposed and Existing Wind Energy Projects in Kansas, December 2006



N

30 15 0 30 60 Miles

30 15 0 30 60 Kilometers

Projection Information:
Name: Lambert Conformal Conic
Datum: NAD83 Spheroid GRS 1980
Distance Units: meters

Existing

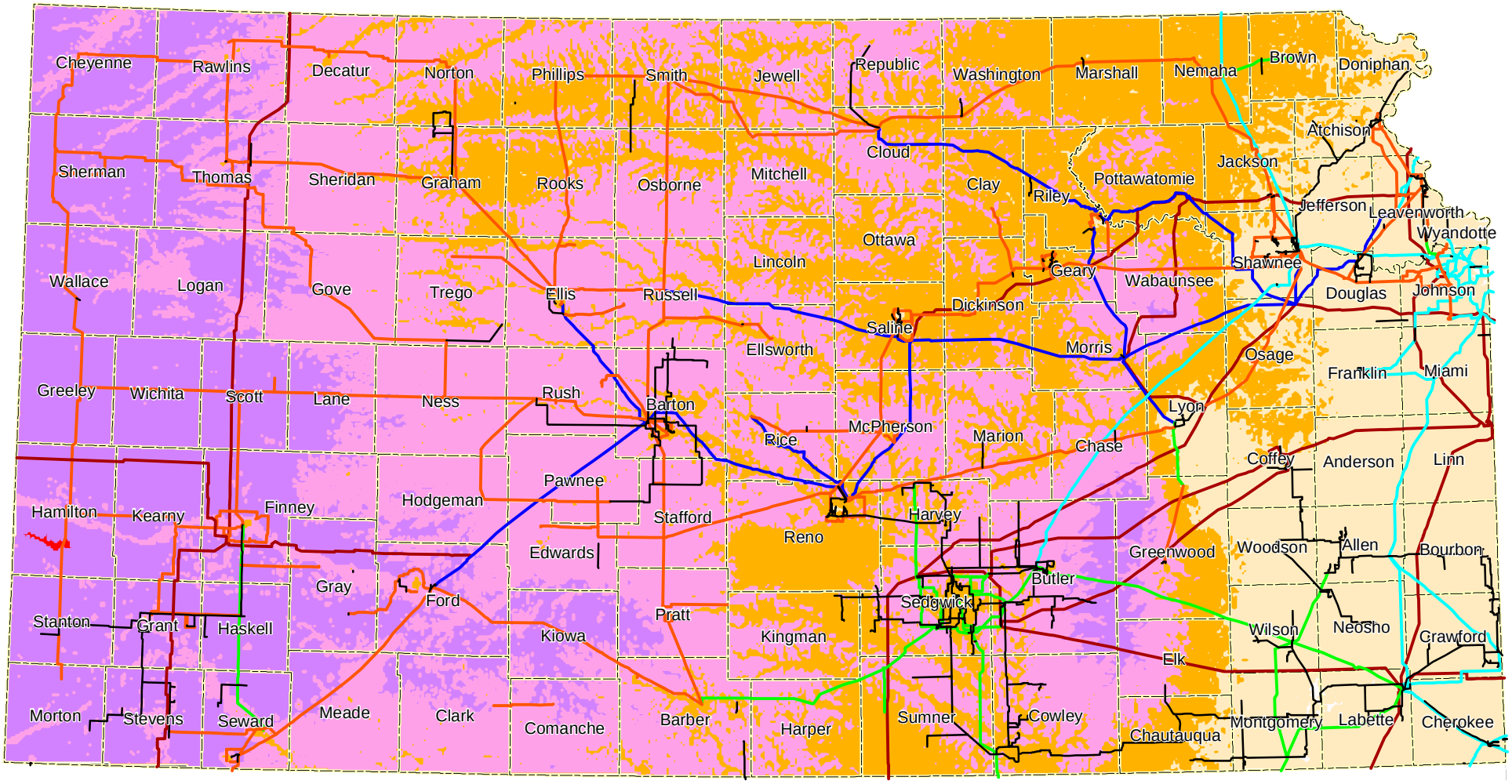
Under Construction

Proposed

Electrical Transmission Lines also shown

Source: Kansas Energy Information Network, www.kansasenergy.org

Kansas Wind Energy Resource Map and Electric Transmission



Miles

0 15 30 60 90 120

Electric Transmission Lines

- 345 - KV
- 230 - KV
- 161 - KV
- 138 - KV
- 115 - KV
- 69 - KV

Wind Speed at 50 meters	(m/s)	(mph)	Wind Power Density at 50m W/m²
Class 1:	0.00 - 5.60	0.00 - 12.5	0 - 200
Class 2:	5.60 - 6.40	12.5 - 14.3	200 - 300
Class 3:	6.40 - 7.00	14.3 - 15.7	300 - 400
Class 4:	7.00 - 7.50	15.7 - 16.8	400 - 500
Class 5:	7.50 - 8.00	16.8 - 17.9	500 - 600
Class 6:	8.00 - 8.80	17.9 - 19.7	600 - 700
Class 7:	> 8.80	> 19.7	> 700

N

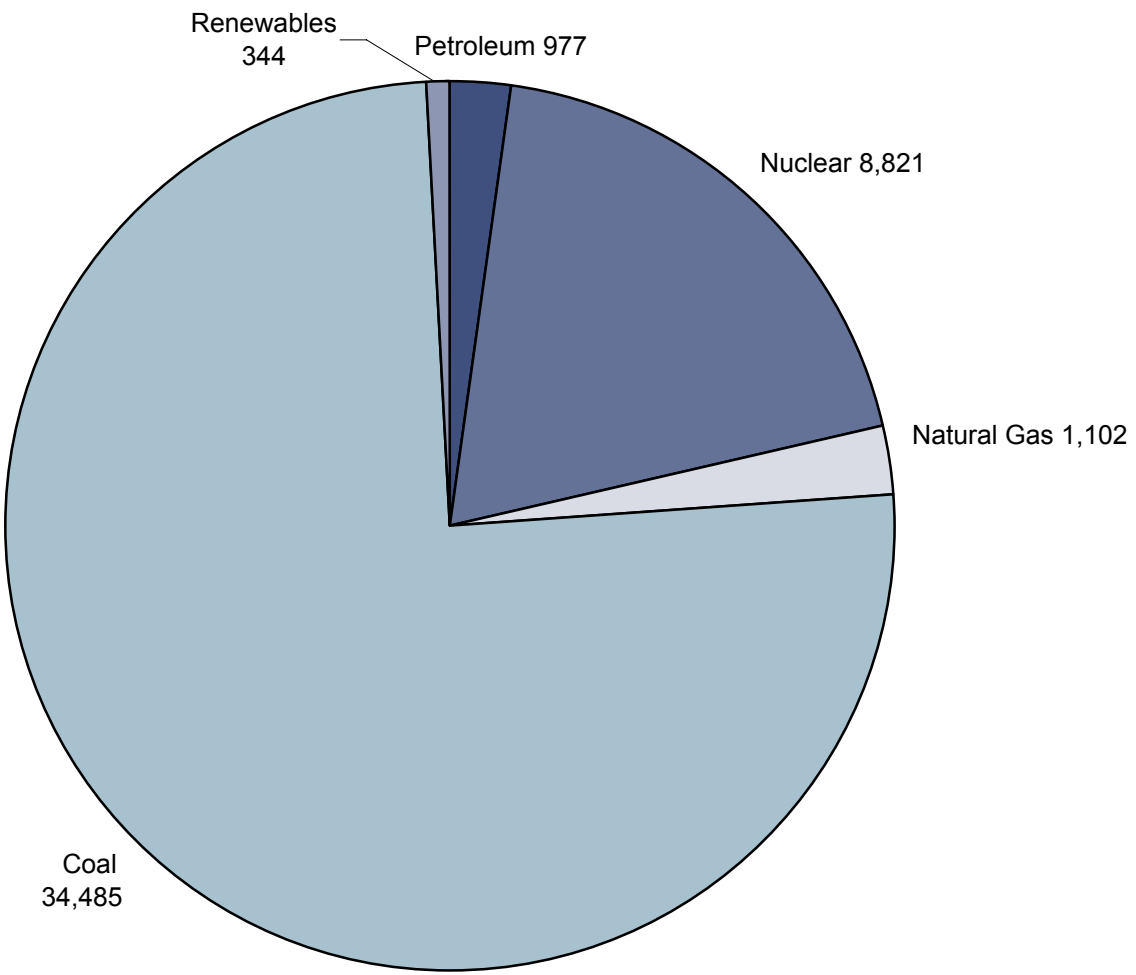
The wind resource estimates presented on this map were developed by Coriolis-AE using WindMap TM. The spatial grid resolution is of 1000 (app) meters.

Development of this map was performed under contract with the Kansas Corporation Commission Energy Program withfunding from the U. S. Department of Energy's Wind Power America Program.

This map may be viewed on the web at: http://www.kcc.state.ks.us/energy/wind.htm

Kansas Corporation Commission
26 March 2004

Kansas Net Electrical Generation, Thousand Megawatthours, 2005



Source: Electric Power Monthly, various months, DOE/EIA-0226 (2005-2006/VARIOUS)

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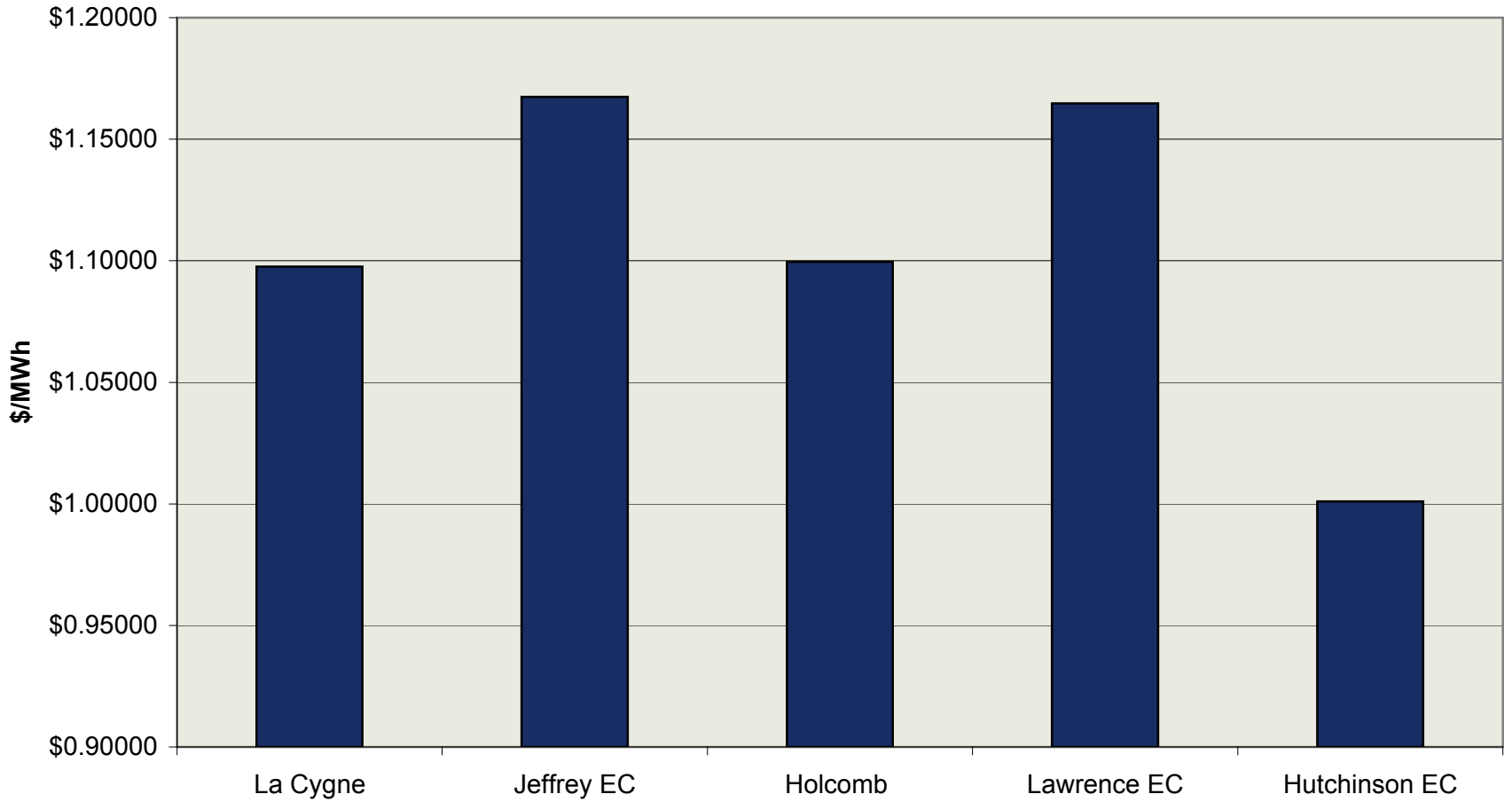
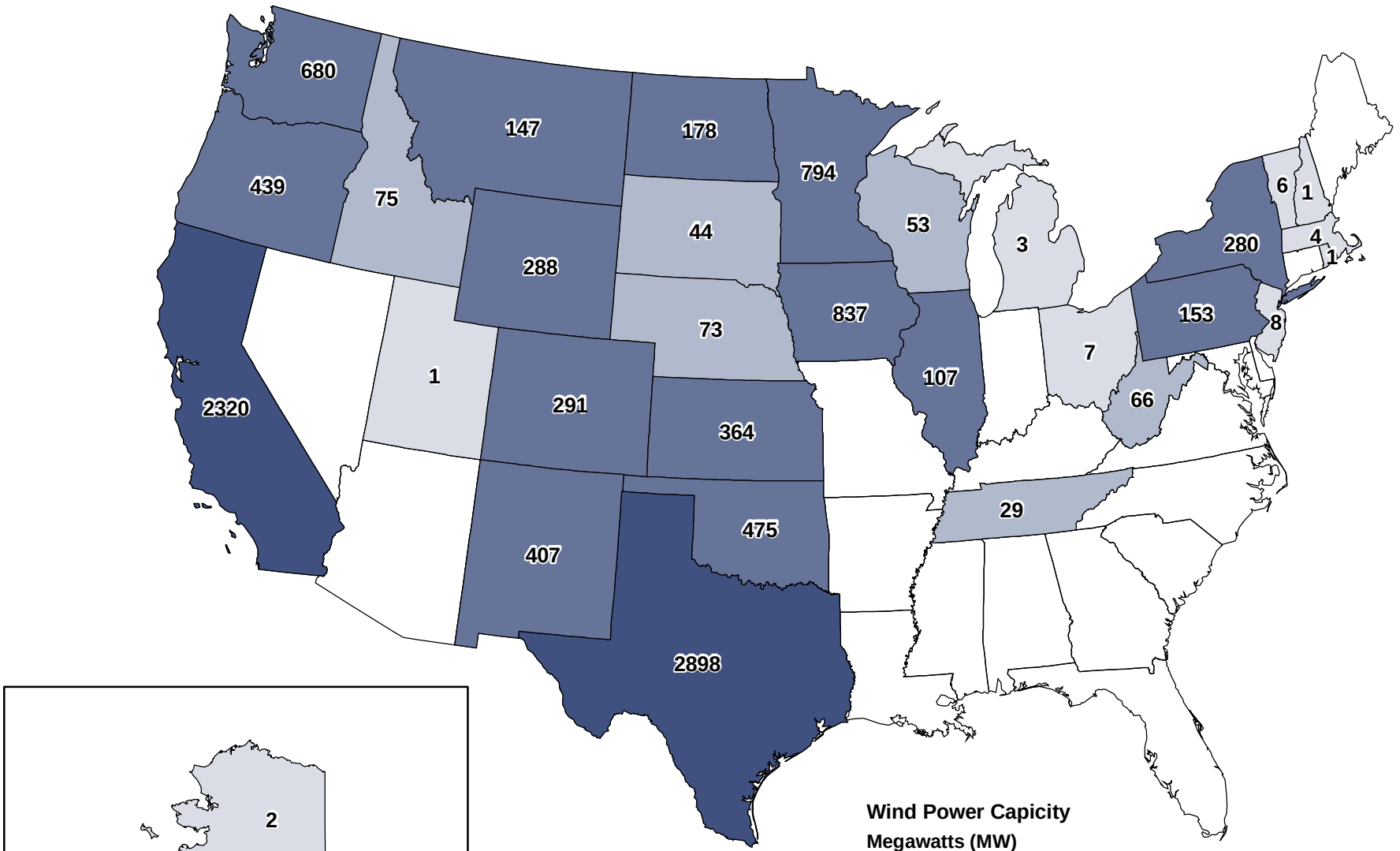


Source: Based on 2005 data from EIA-906/920 and EIA-860 databases, Dec. 2005, http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html

U.S. Installed Wind Energy Capacity in Megawatts (MW), November 2006

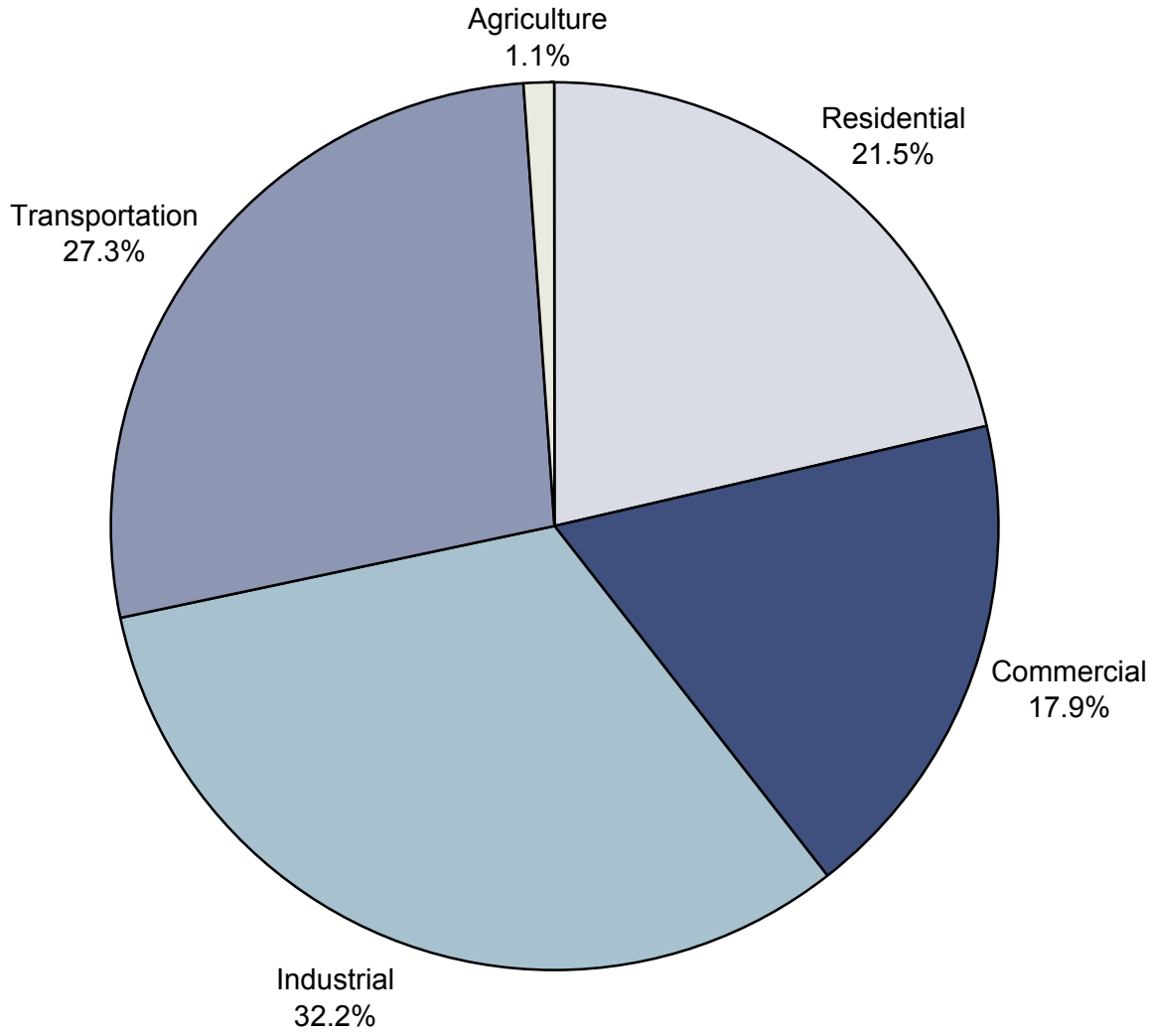


Source: U.S. Department of Energy National Renewable Energy Laboratory

Chapter 9

Energy Conservation and Efficiency

U.S. Direct Energy Consumption by Sector, 2002



Source: Kastens, T., K. Dhuyvetter, et al., Energy Use in the Kansas Agricultural Sector, Kansas Energy Council, June 15, 2006.

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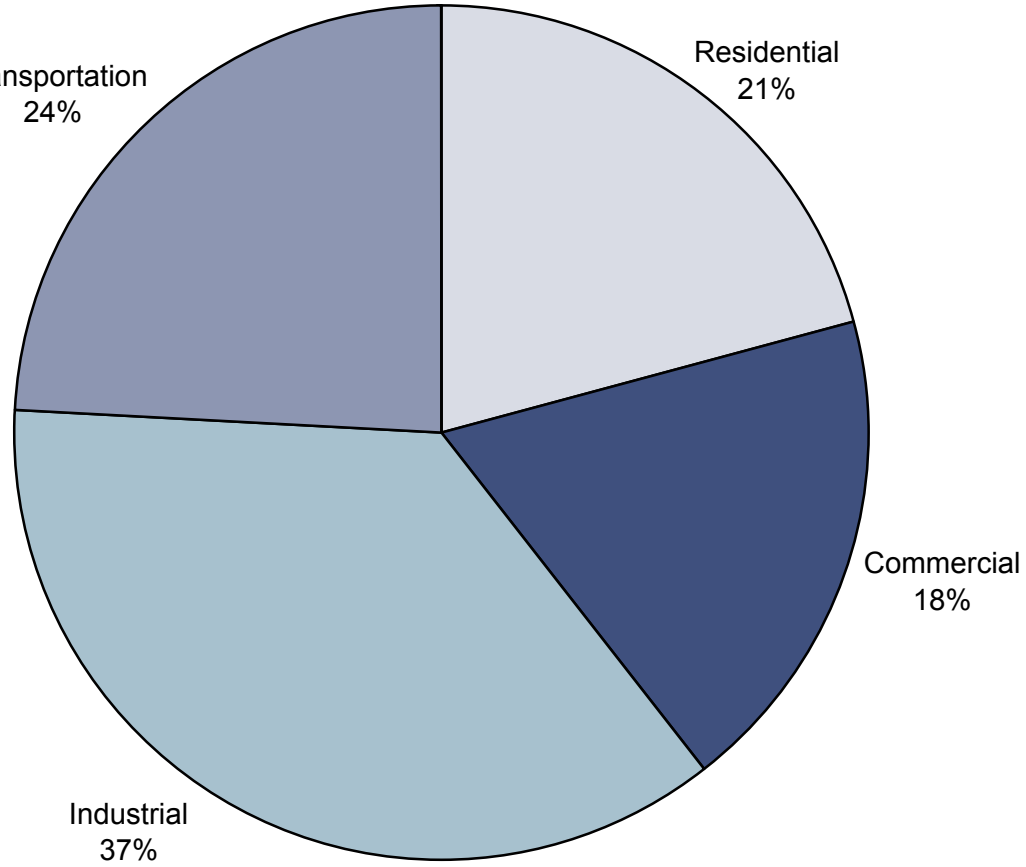
Kansas Direct Energy Consumption by Sector, 2002

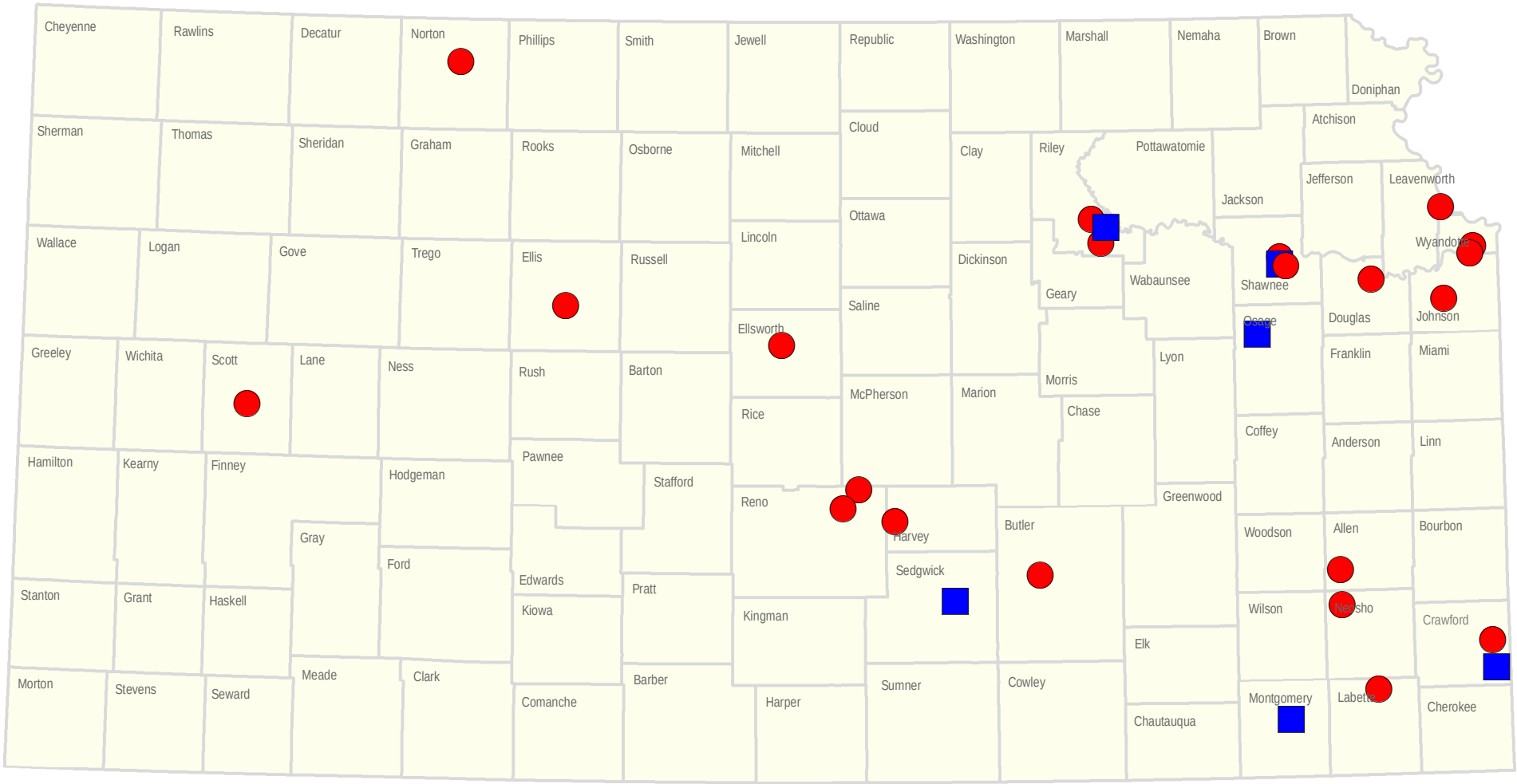


Agriculture sector consumption is negligible and not separaated out in these data.

Kansas Energy Chart Book, Chapters 9, 11

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data 2002.

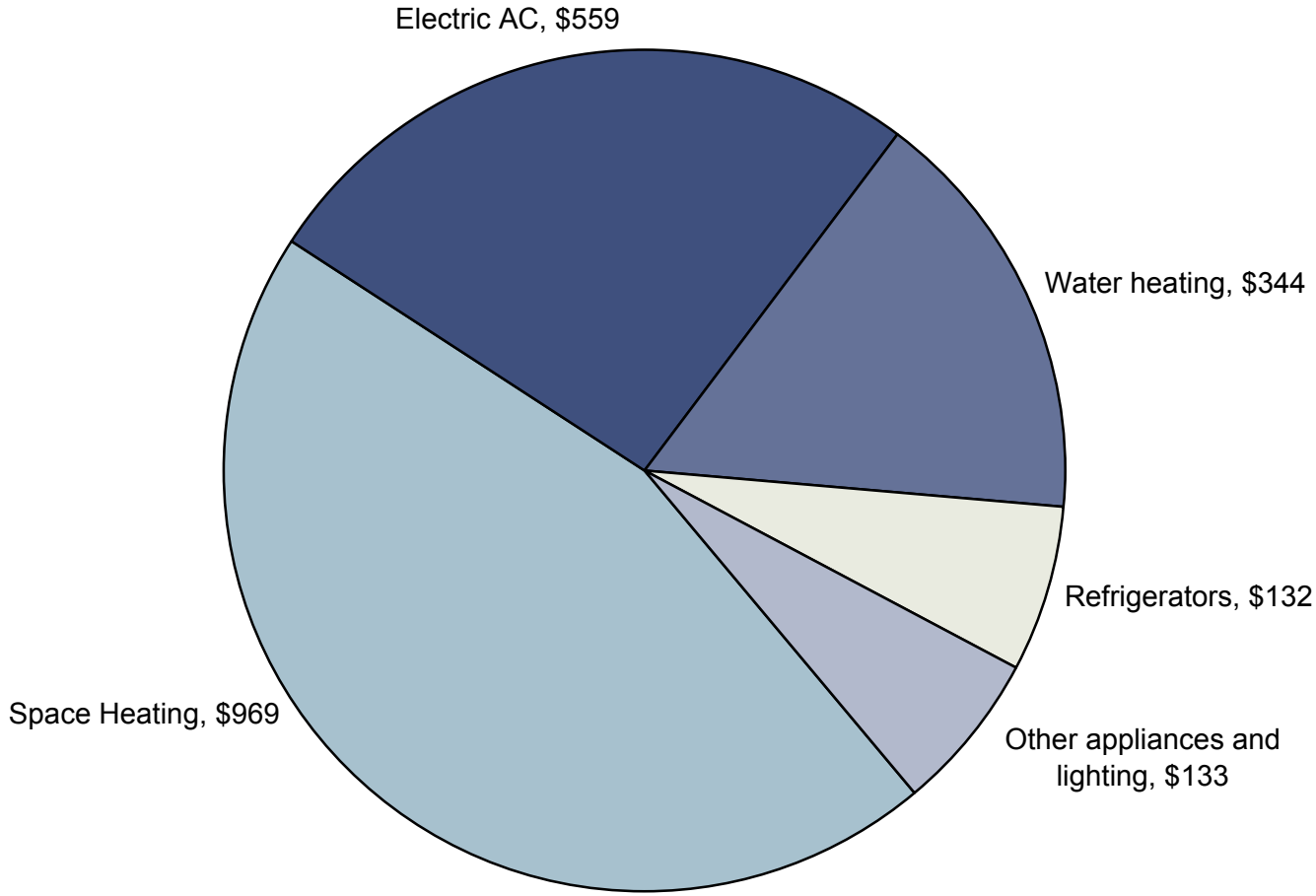
Kansas Facility Conservation Improvement Program (FCIP): Projects Completed and Ongoing, December 2006



Kansas Energy Chart Book, Chapter 9

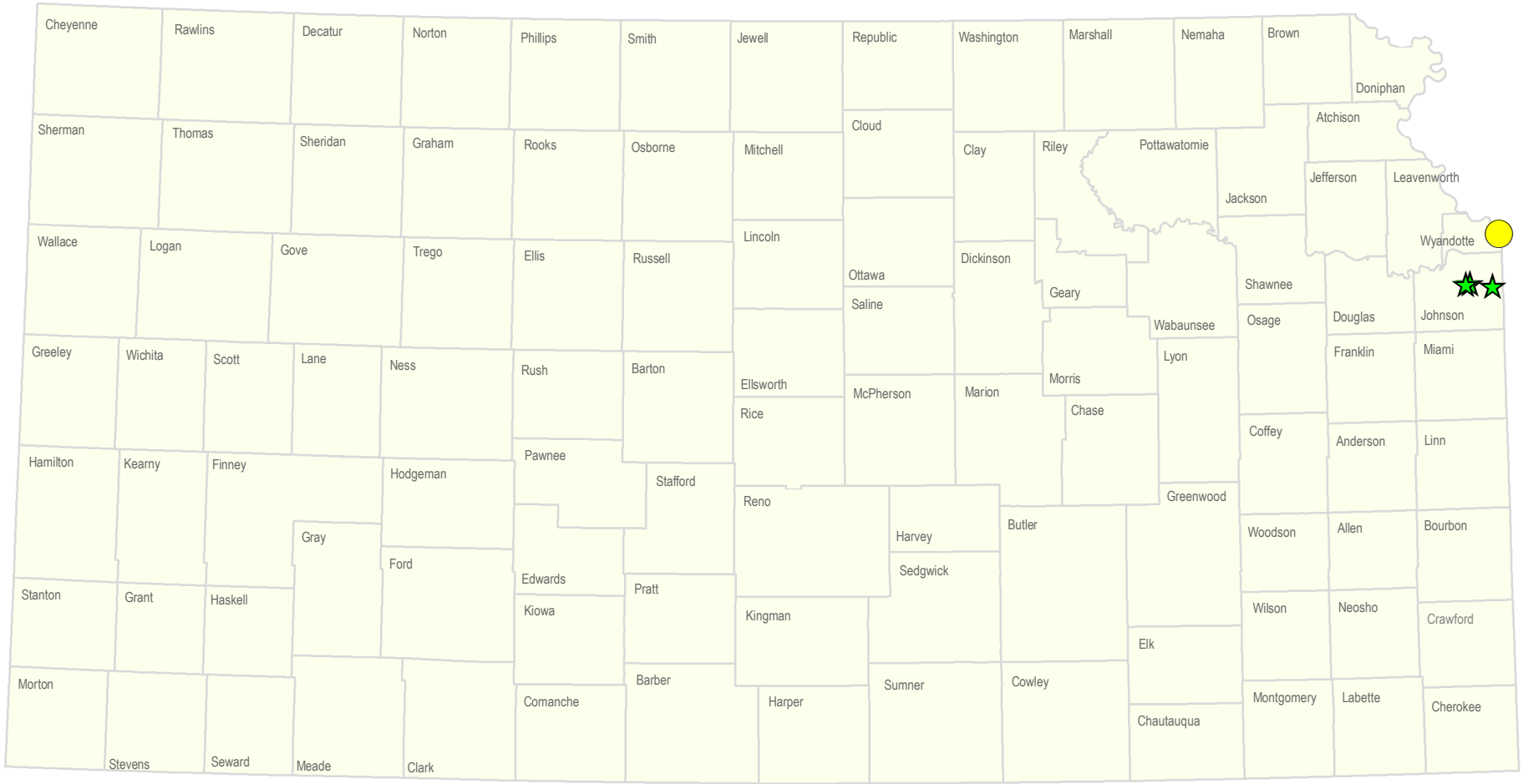
Source: Kansas Energy Office.

Kansas Average Annual Household Energy Expenditures



Source: Alliance to Save Energy, http://www.ase.org/content/article/detail/2798 (October 2, 2006)

LEED-certified Green Buildings in Kansas, December 2006



N

30 15 0 30 60 Miles

40 20 0 40 80 Kilometers

Projection Information:
Name: Lambert Conformal Conic
Datum: NAD83 Spheroid GRS 1980
Distance Units: meters

Leadership in Energy and Environmental Design (LEED) Green Building Rating System

★ Certified

● Gold

Kansas LEED-certified buildings

1) EPA Science and Technology Center, Kansas City
2) City of Olathe Municipal Service Center, Olathe
3) EcoWorks at Southlake Phase One, Lenexa
4) 6480 Sprint Parkway, Overland Park

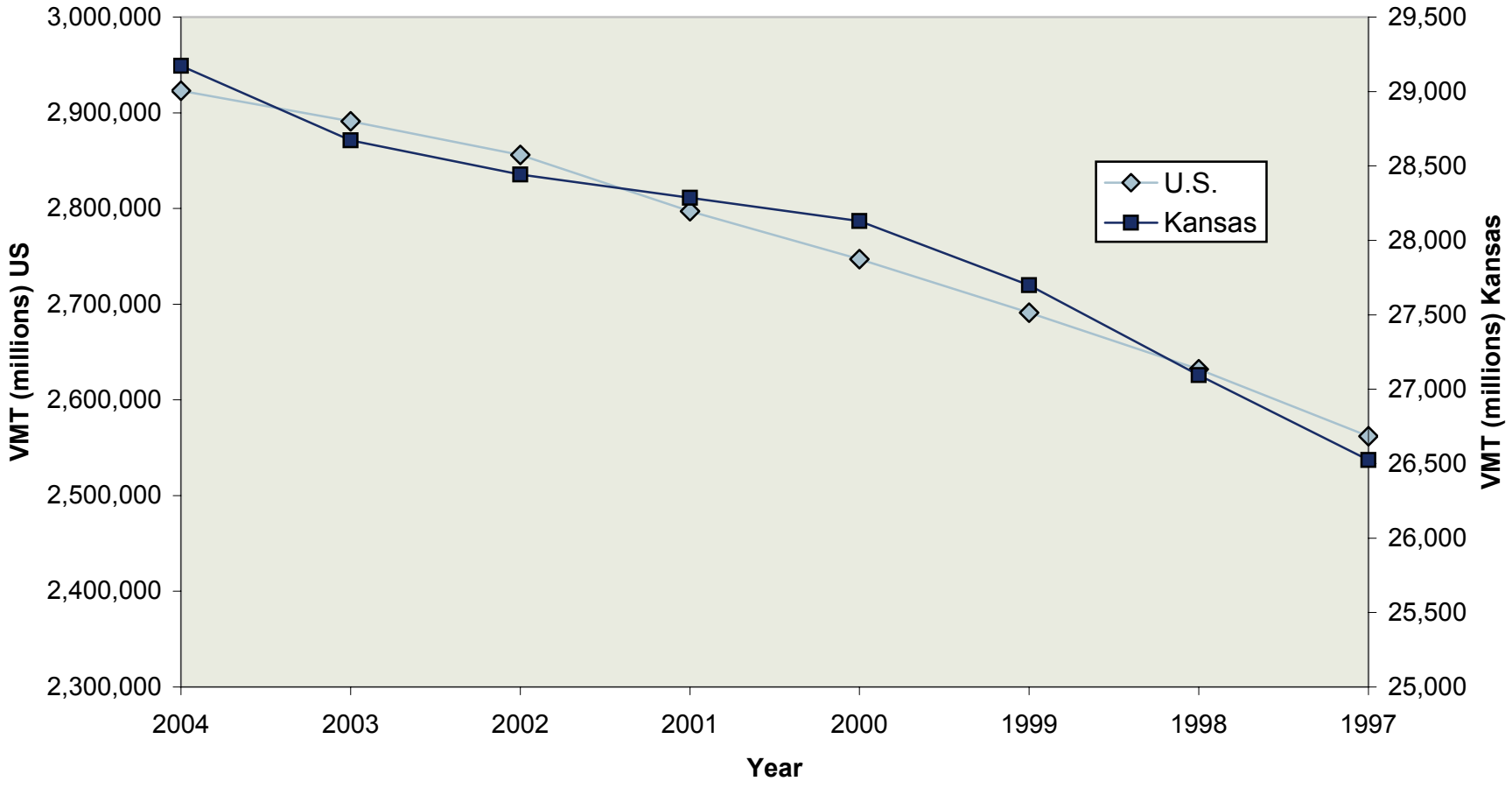
Colorado has 25 LEED-certified buildings, Missouri has 10, Nebraska has 2, and Oklahoma has 1.

Source: U.S. Green Building Council web-site, http://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx

Chapter 10

Energy Use in the Transportation Sector

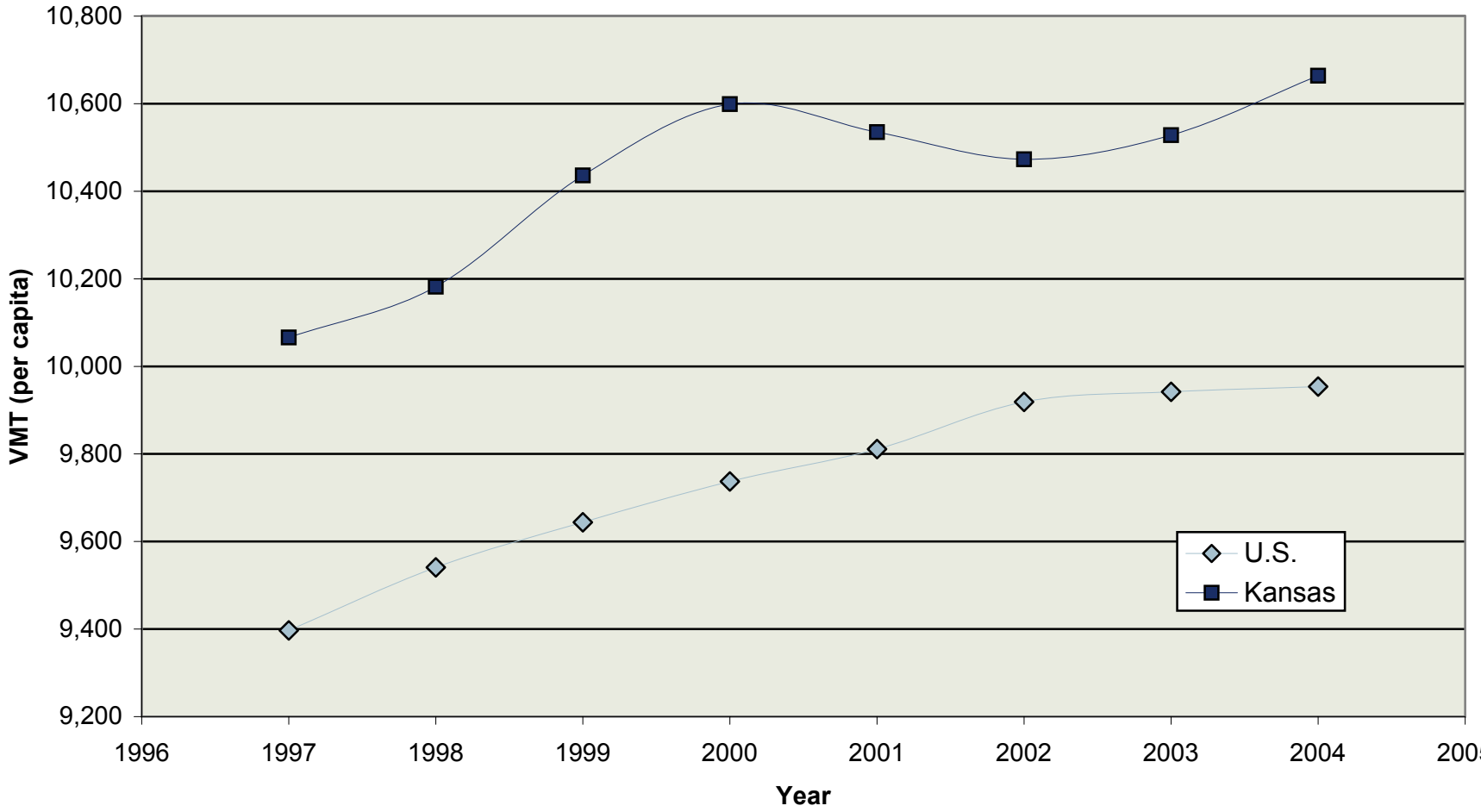
Total Vehicle Miles Traveled (VMT) in Kansas and the U.S., from 1997 to 2004



Kansas Energy Chart Book, Chapter 10

Source: Bureau of Transportation Statistics (www.bts.gov).

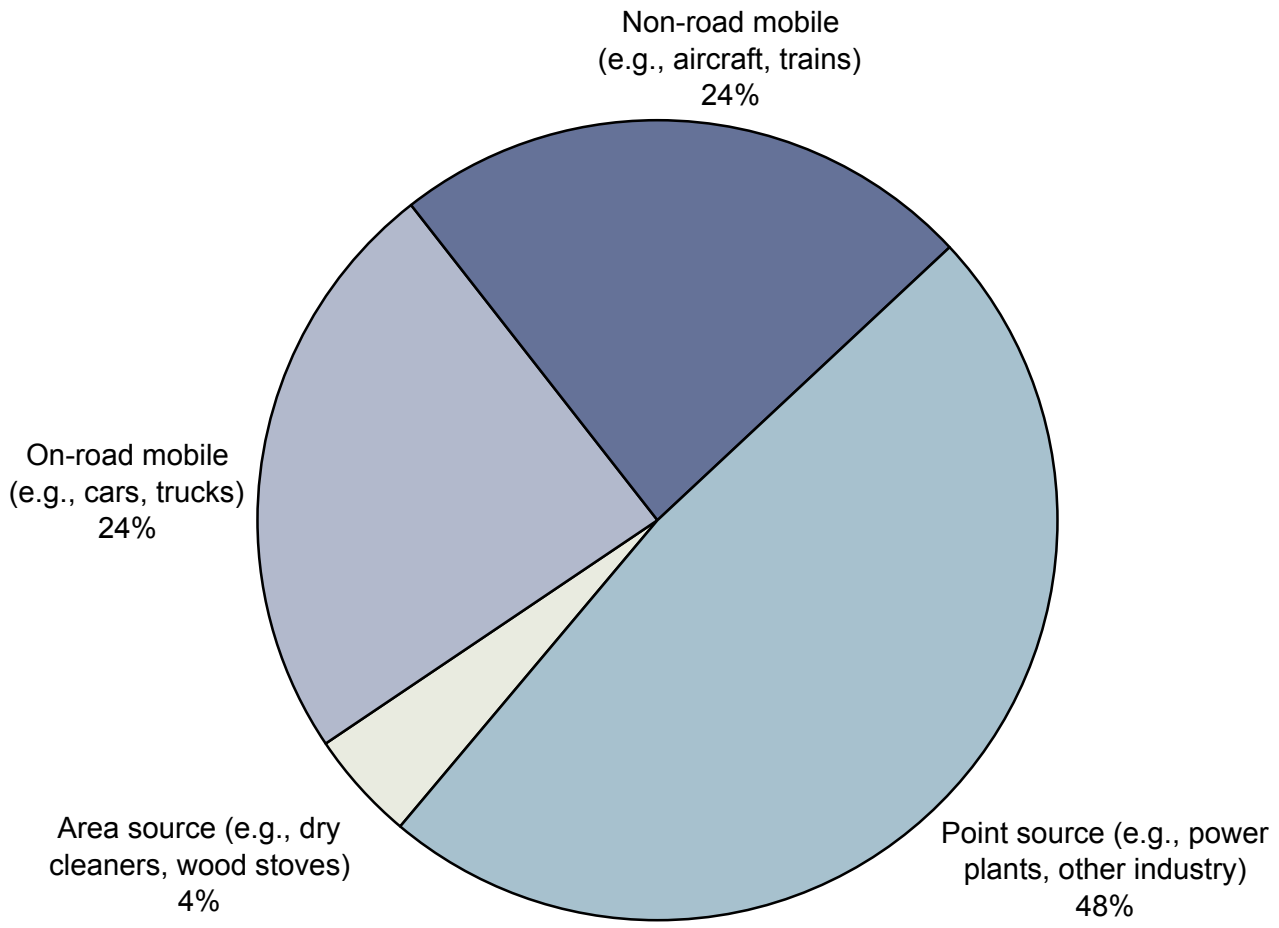
Average Vehicle Miles Traveled (VMT) per Capita in Kansas and the U.S., from 1997 to 2004



Kansas Energy Chart Book, Chapter 10

Source: Bureau of Transportation Statistics (www.bts.gov).

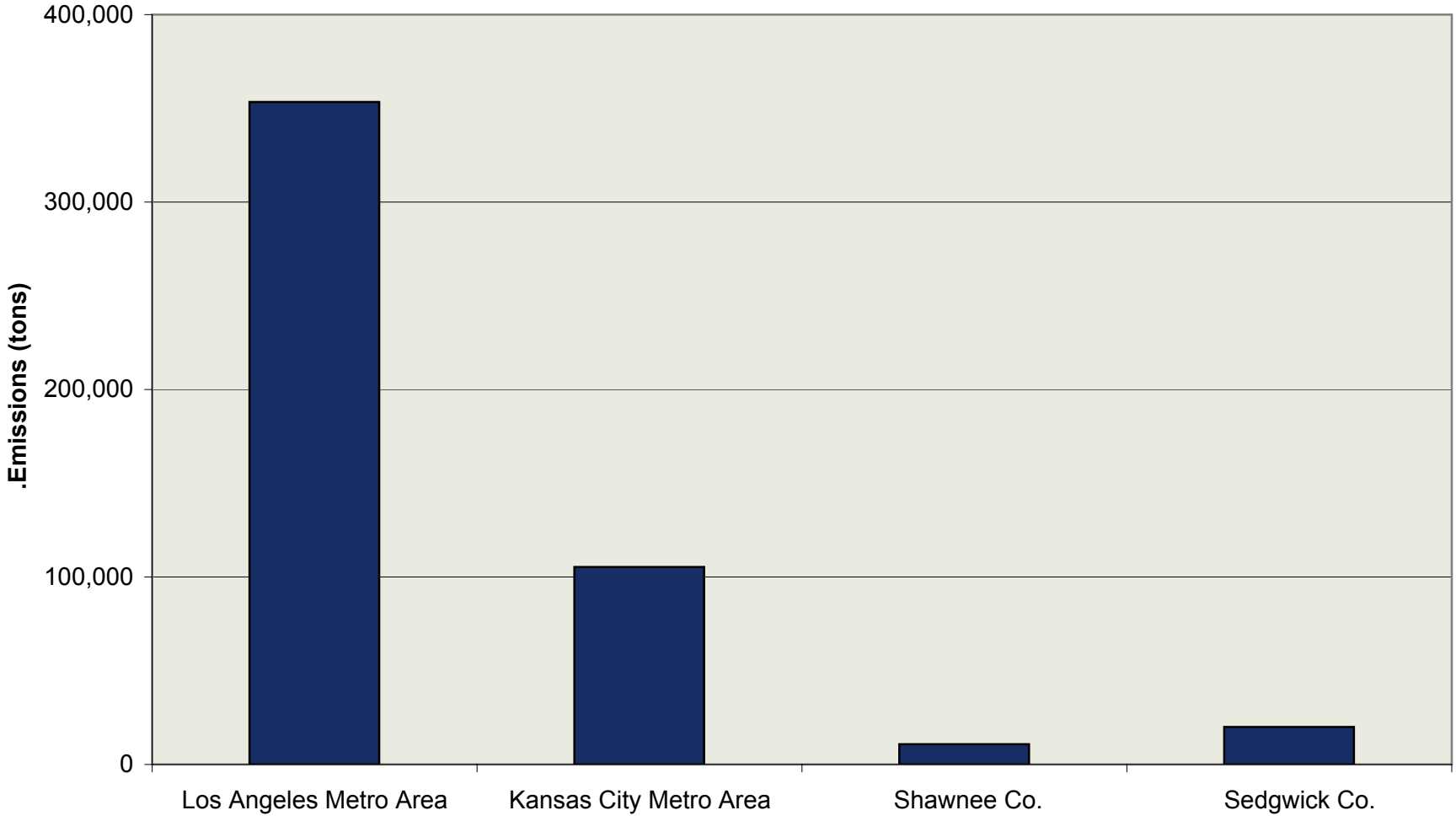
Kansas Total NO_x Emissions by Source, 2002



Kansas Energy Chart Book, Chapters 3, 10

Source: KDHE Bureau of Air and Radiation, based on 2002 National Emissions Inventory (NEI).

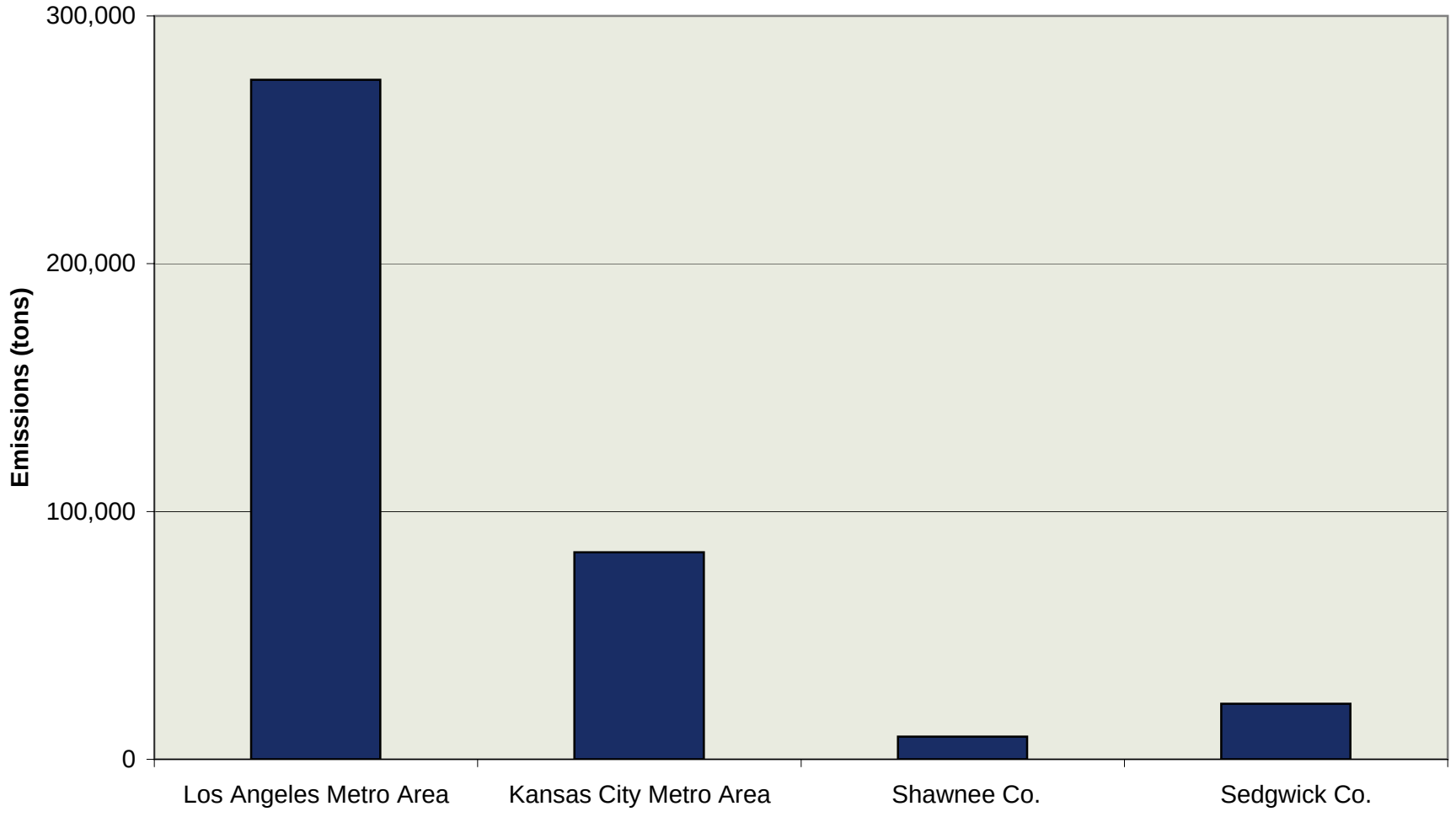
Comparison of NO_x Emissions in Selected Areas of Kansas and Los Angeles, 2002



Kansas Energy Chart Book, Chapter 10

Source: KDHE Bureau of Air and Radiation, based on 2002 National Emissions Inventory (NEI).

Comparison of Volatile Organic Compound (VOC) Emissions in Selected Areas of Kansas and Los Angeles, 2002



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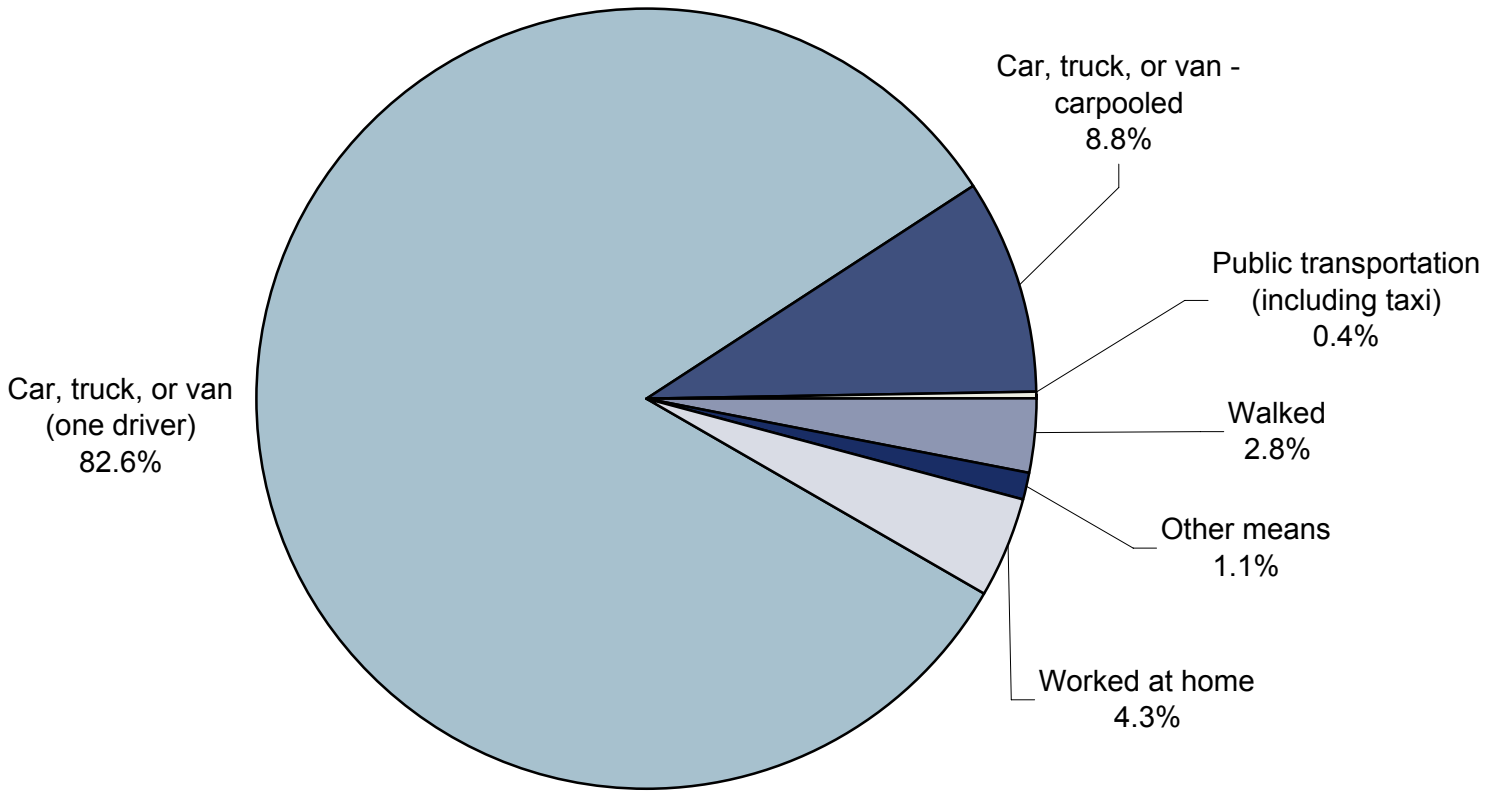
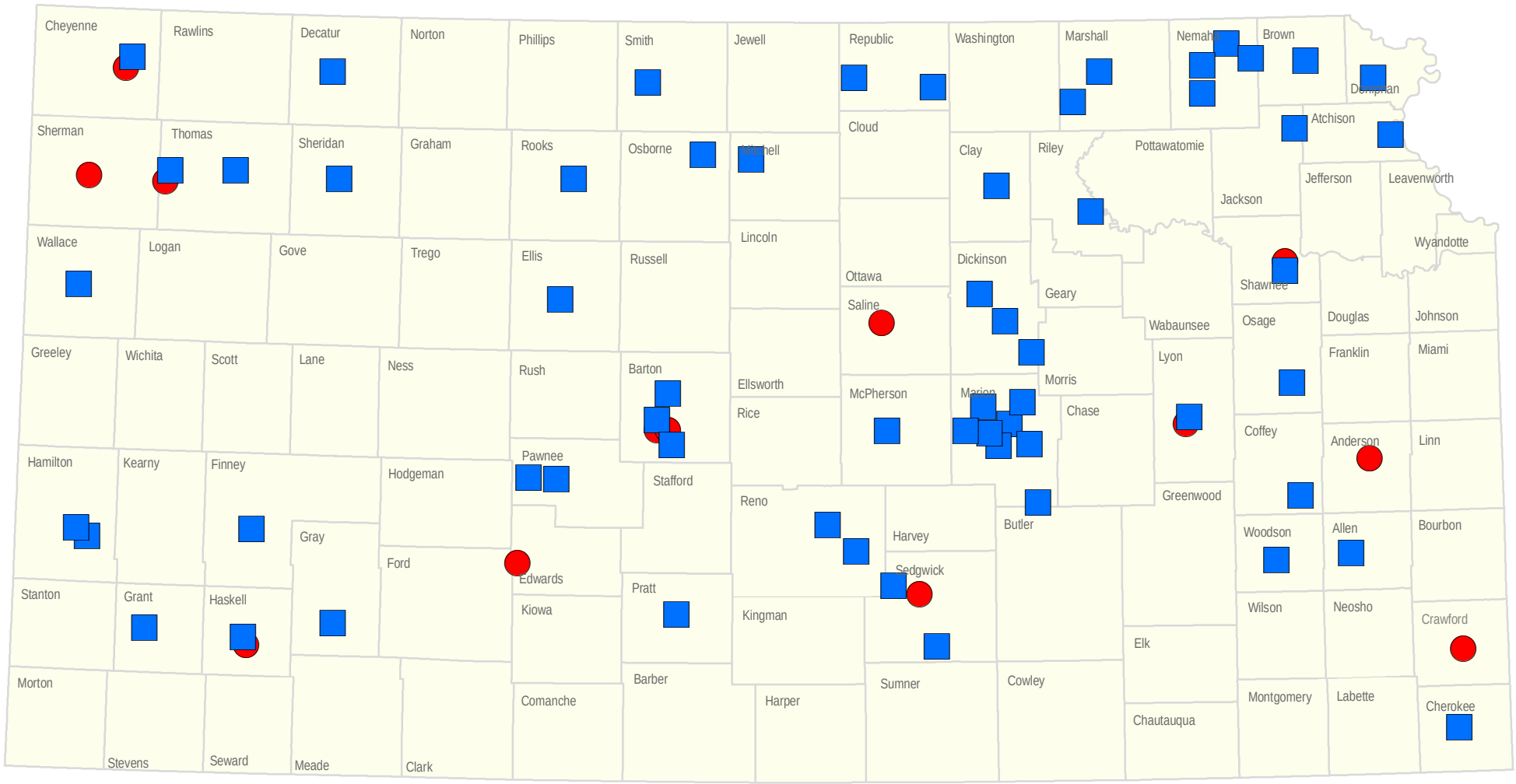
Commuting to Work in Kansas, 2005



Source: http://www.bts.gov/publications/state_transportation_profiles/state_transportation_statistics_2005/html/table_04_01.html

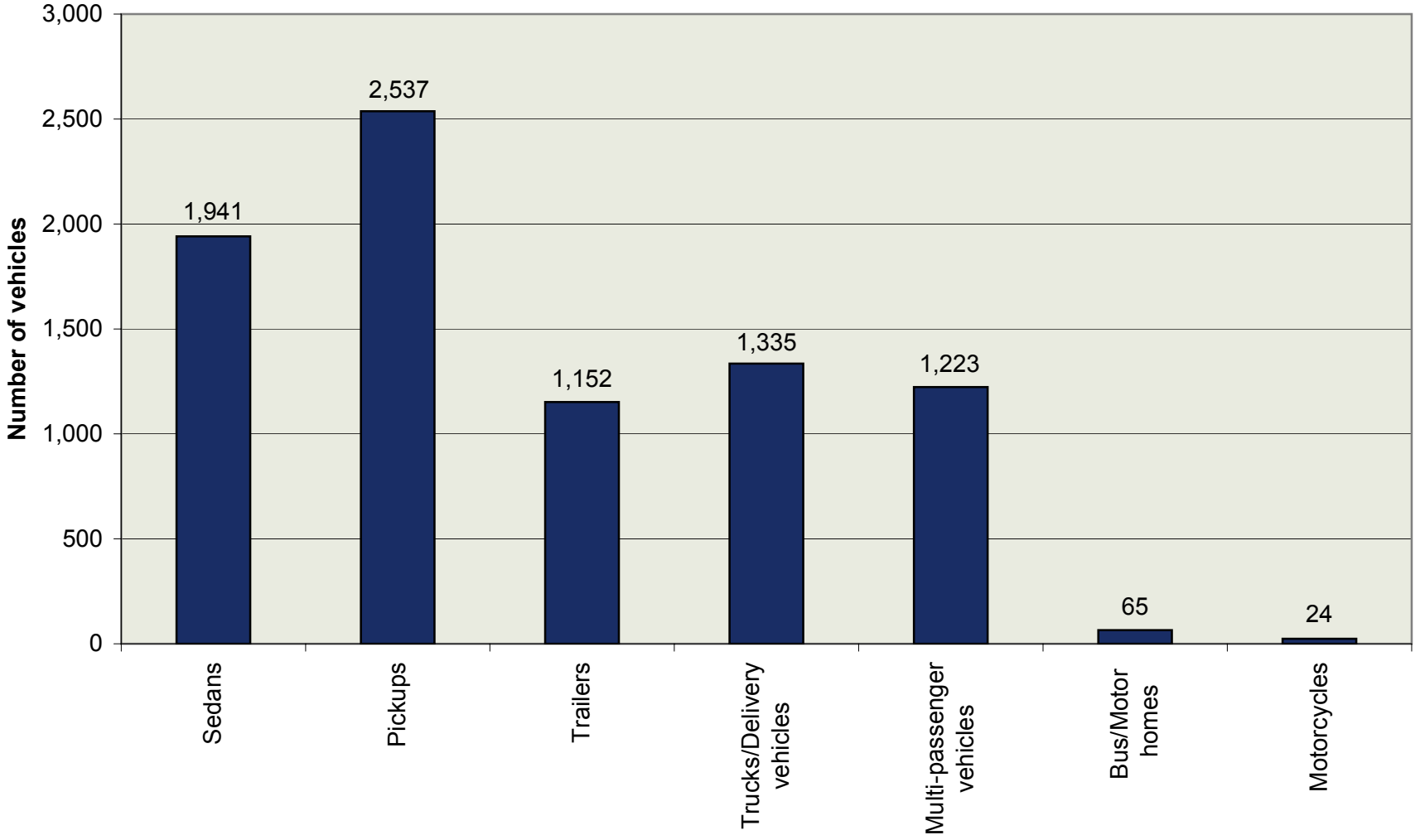
E-85 and Biodiesel Fueling Stations in Kansas, December 2006



Projection Information:
Name: Lambert Conformal Conic
Datum: NAD83 Spheroid GRS 1980
Distance Units: meters

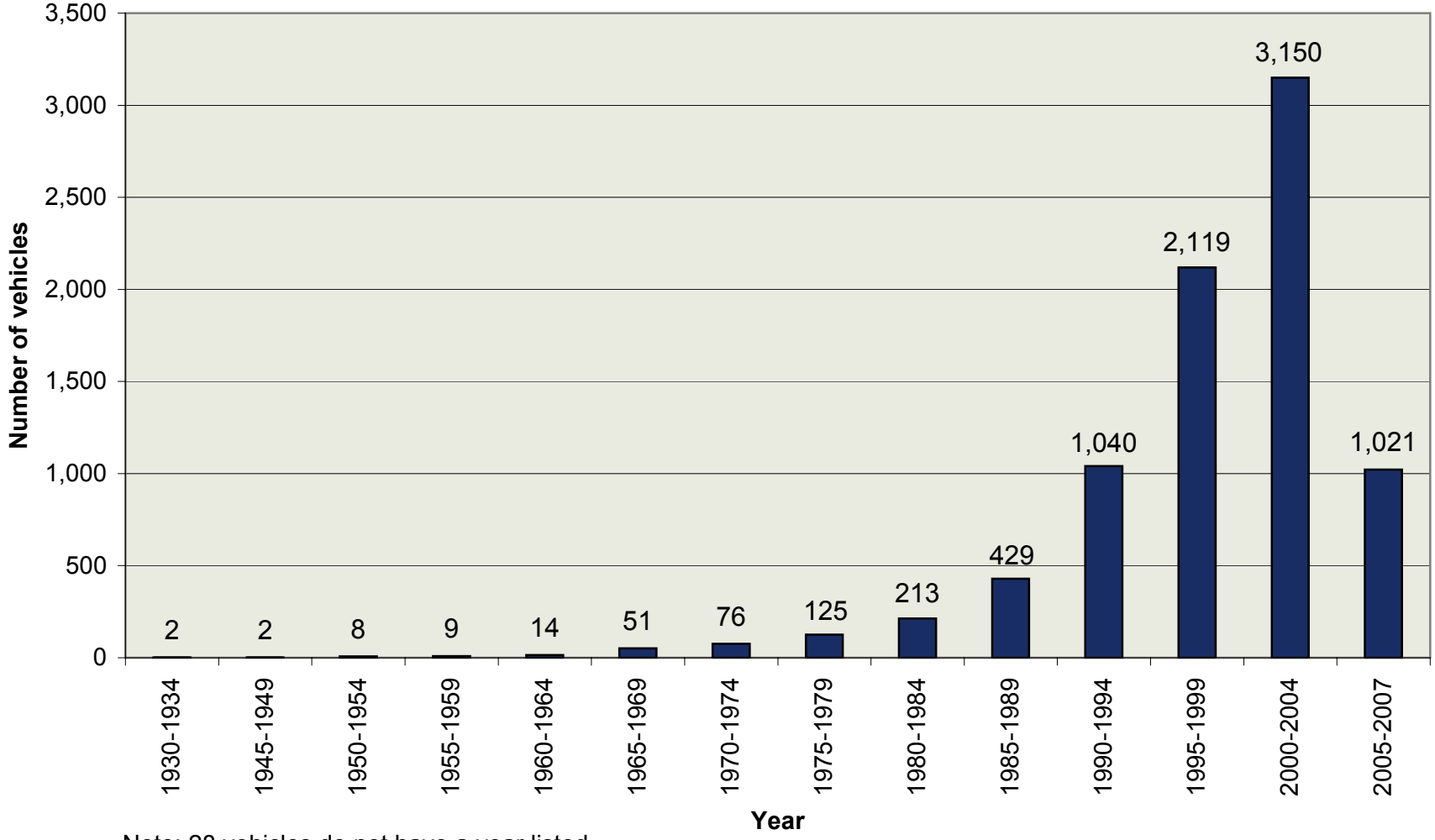
Source: Kansas Energy Office and Kansas Corngrowers Association (www.ksgrains.com)

State of Kansas Vehicle Fleet, 2006: Vehicle Type



Source: Kansas Department of Administration, State Agench Vehicle Usage: http://www.da.ks.gov/fm/cmp/information/vehicle.htm

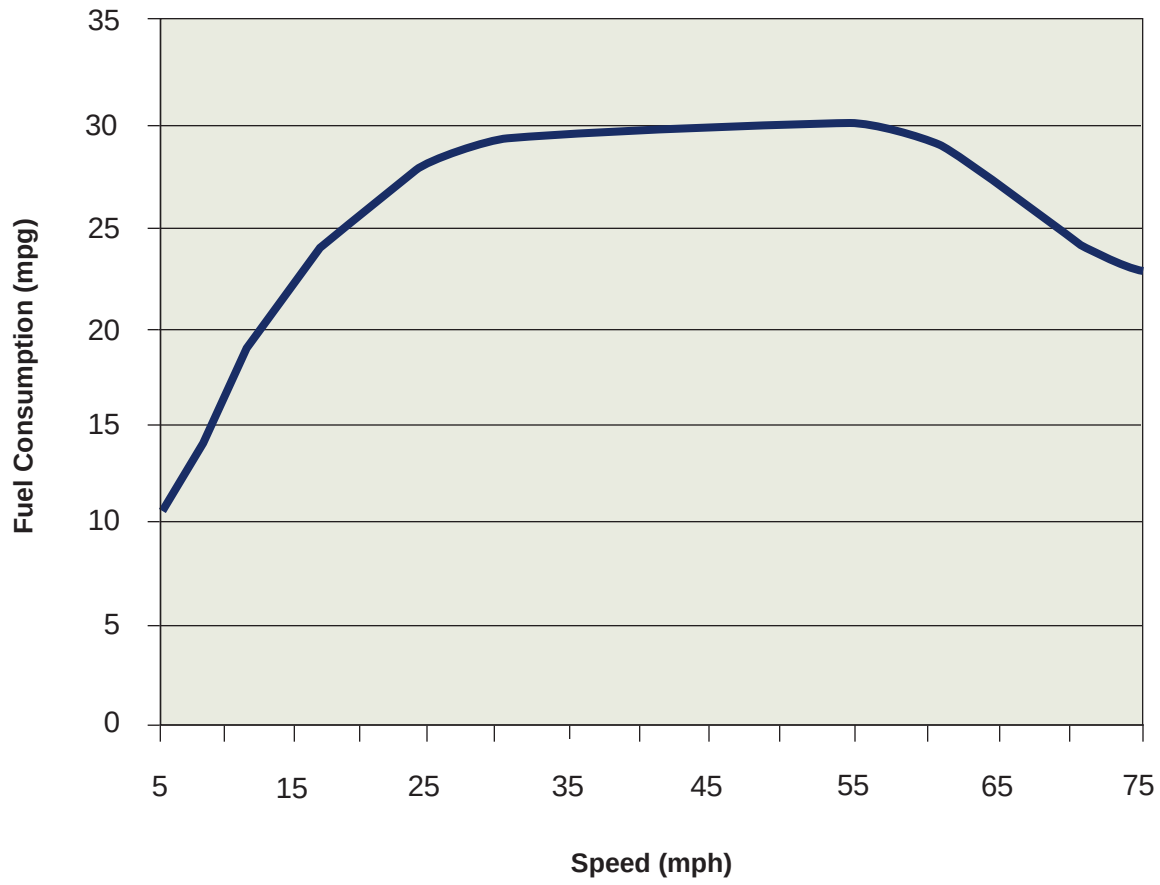
State of Kansas Vehicle Fleet, 2006: Vehicle Year



Note: 28 vehicles do not have a year listed.

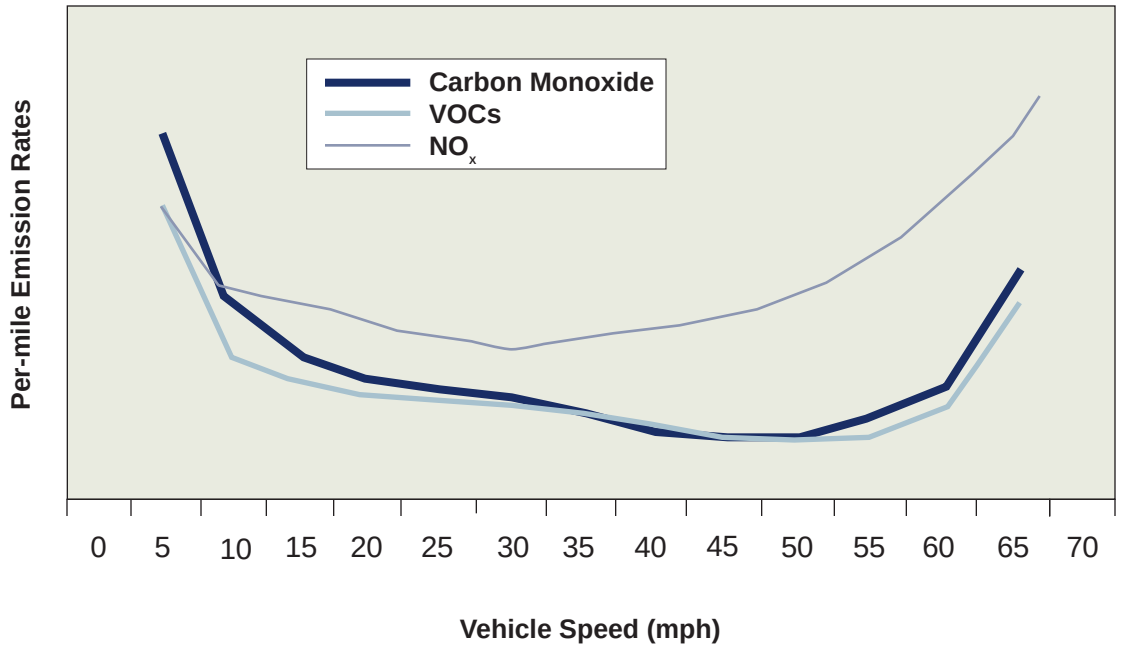
Source: Kansas Department of Administration, State Agench Vehicle Usage: http://www.da.ks.gov/fm/cmp/information/vehicle.htm

Vehicle Speed vs. Fuel Consumption



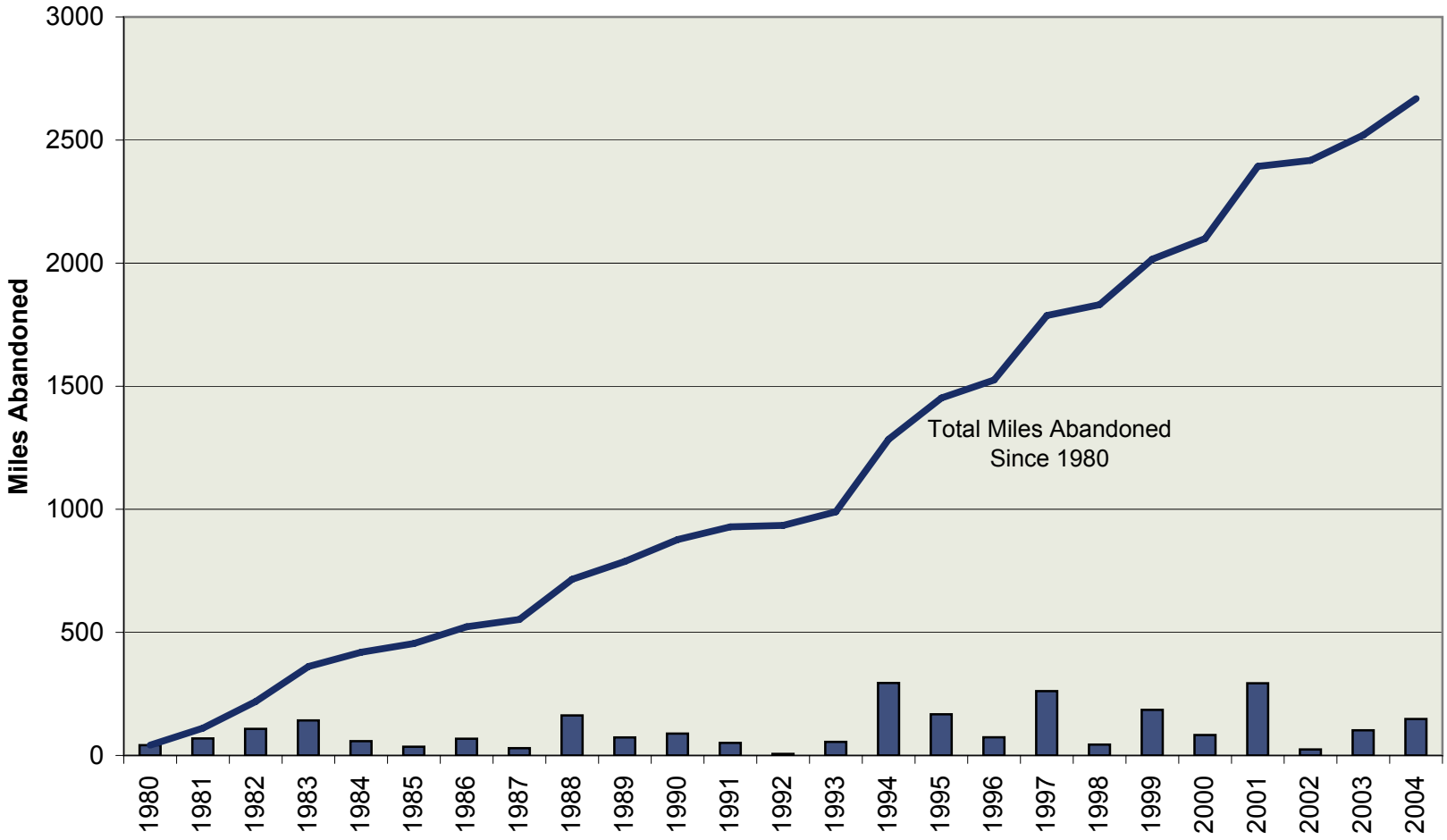
Source: U.S. Department of Energy web site, http://www.fueleconomy.gov/feg/driveHabits.shtml

Vehicle Speed vs. Greenhouse Gas Emissions



Source: http://www.vtpi.org/tdm/tdm12.htm

Kansas Railroad Track Miles Abandoned, 1980-2004



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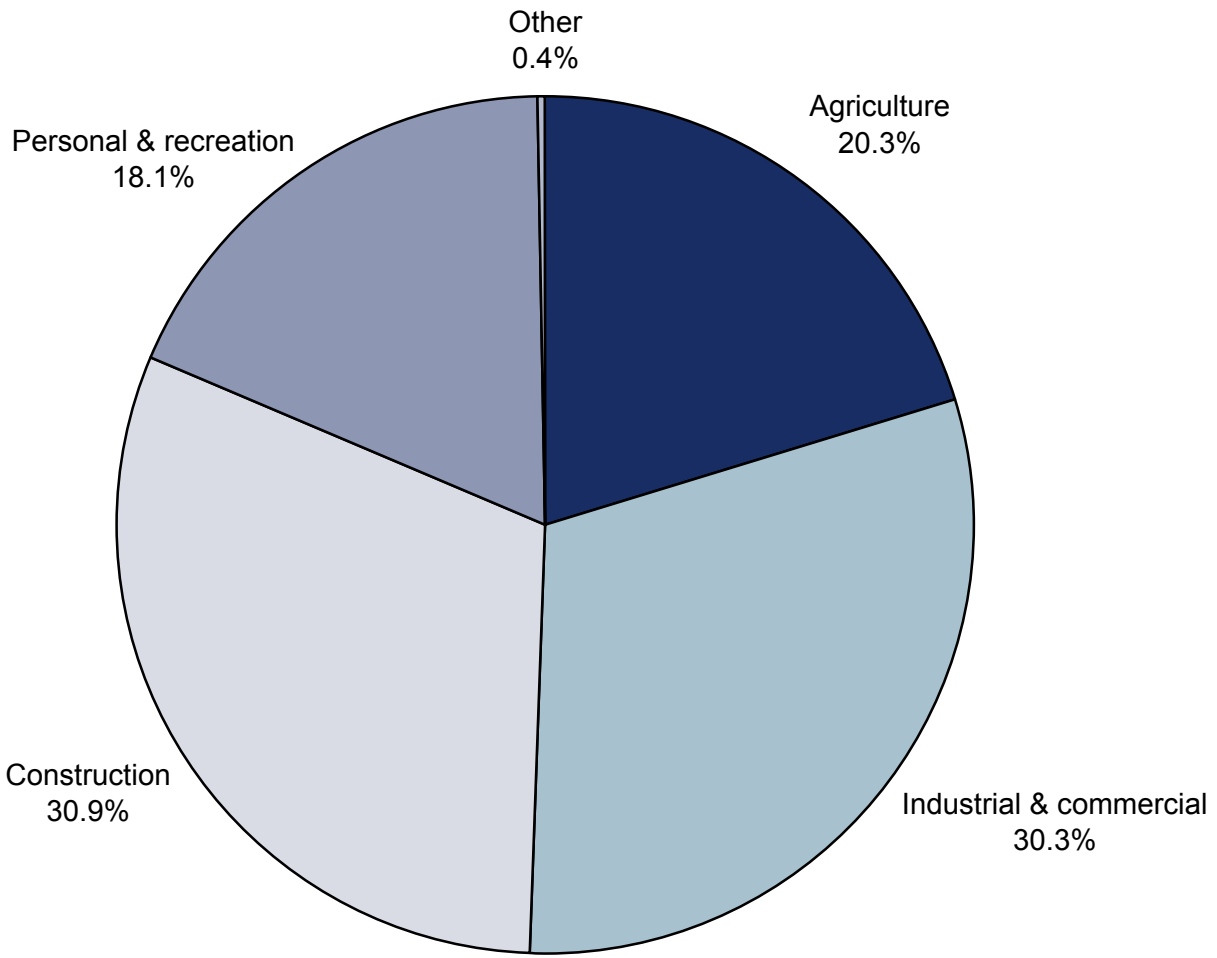
Source: Kansas Department of Transportation rail plan, 2004-2005

Kansas Off-road Fuel Consumption, 2005

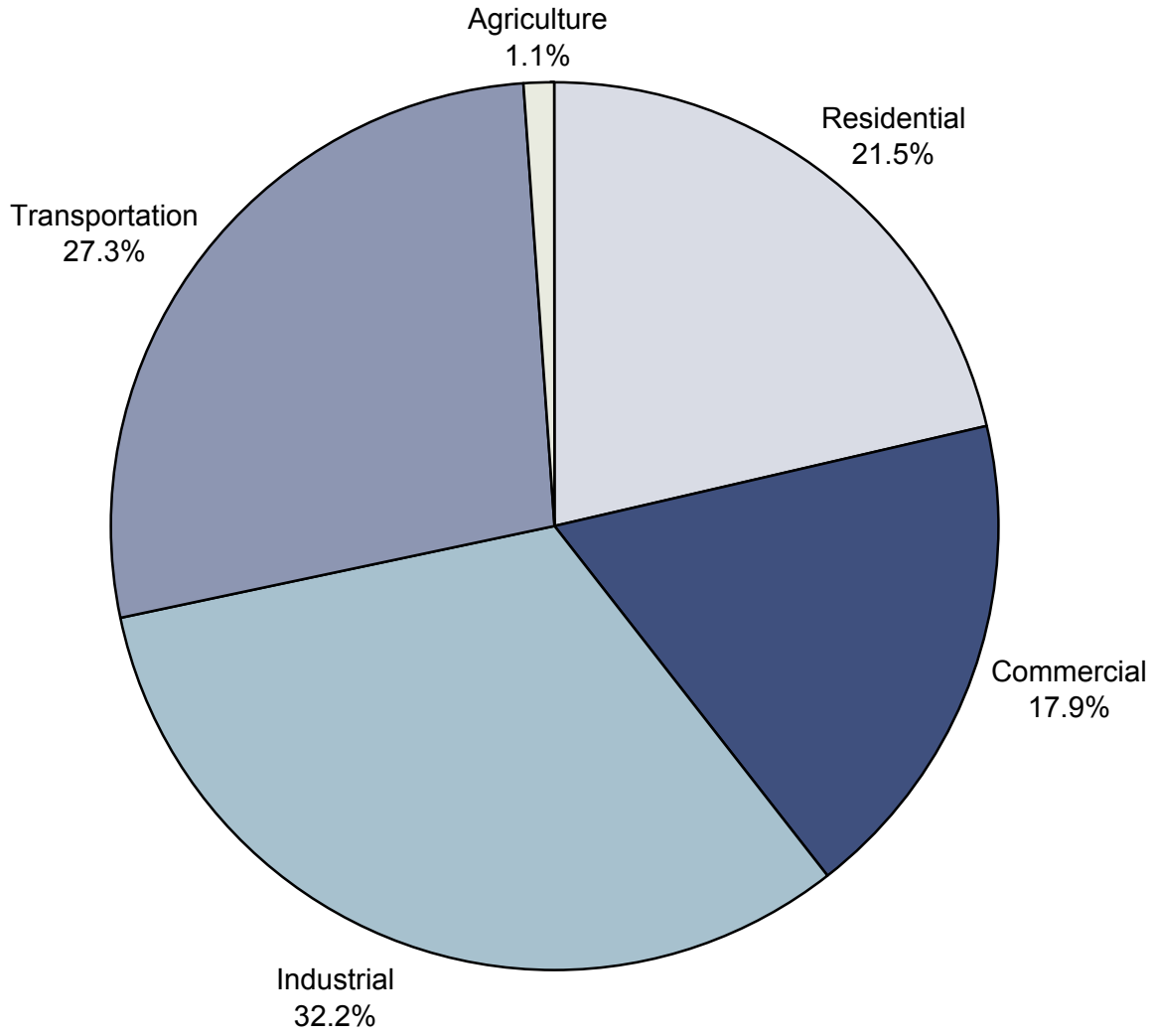


Source: Davis, Stacy C. and Truett, Lorena F. (2005). "Fuel Use for Off-Highway Transportation-Related Vehicles." 84th Annual TRB Meeting, Transportation Research Board, Washington DC, January 9-13, CD-ROM.

Chapter 11

Energy Use in the Agricultural Sector

U.S. Direct Energy Consumption by Sector, 2002



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Kansas Energy Chart Book, Chapters 9, 11

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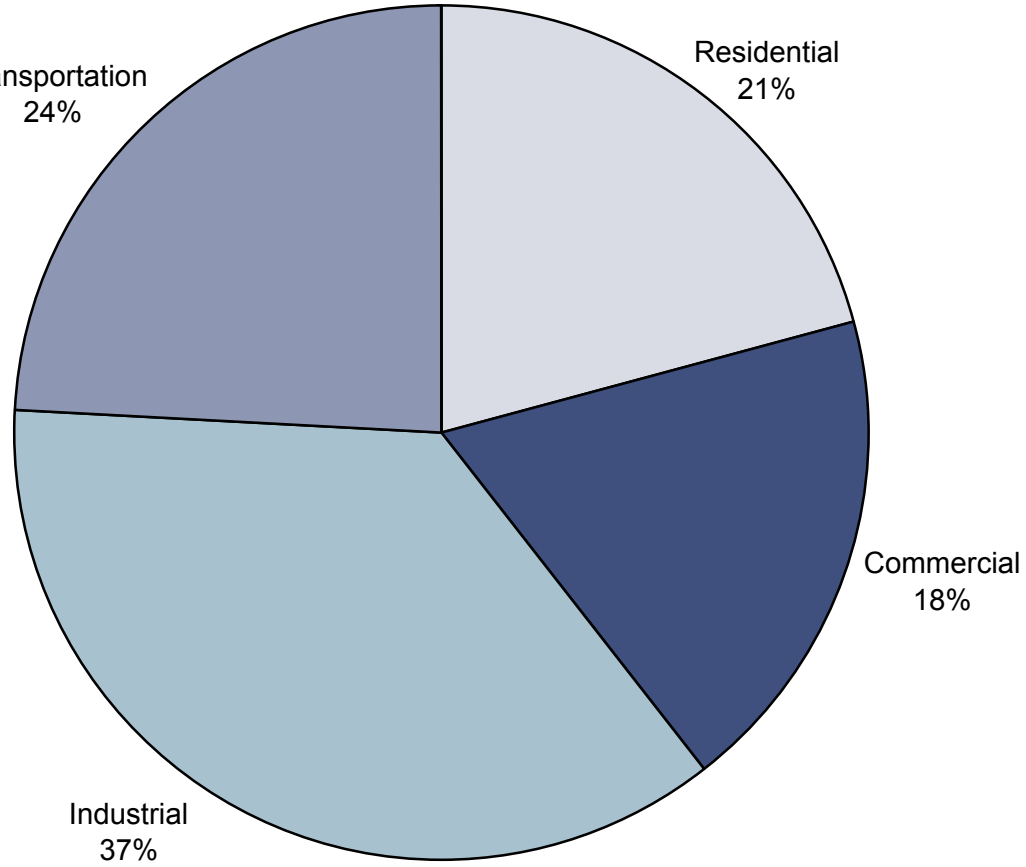

Agriculture sector consumption is negligible and not separaated out in these data.

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Source: U.S. Department of Energy, Energy Information Administration, State Energy Data 2002.

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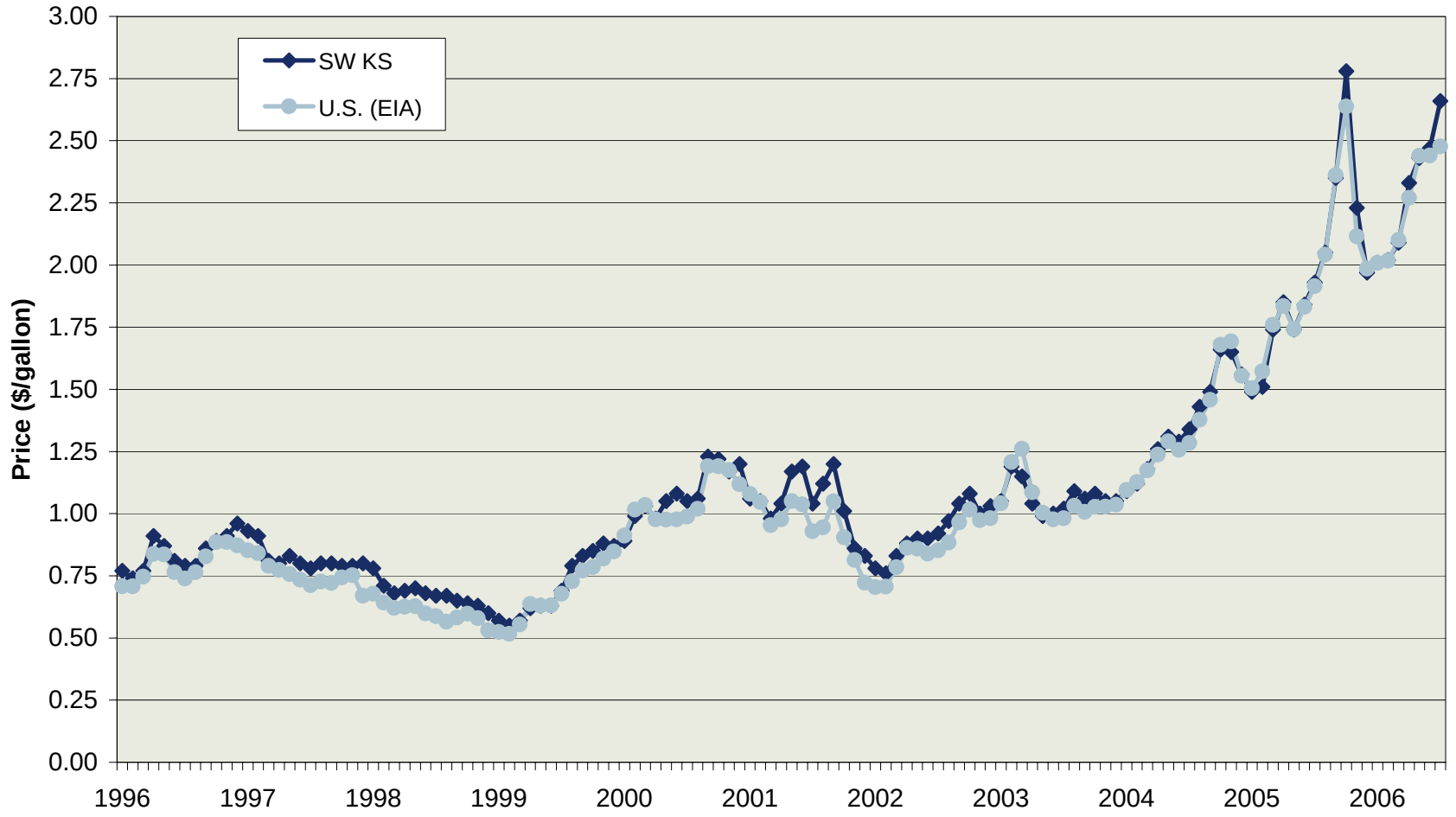

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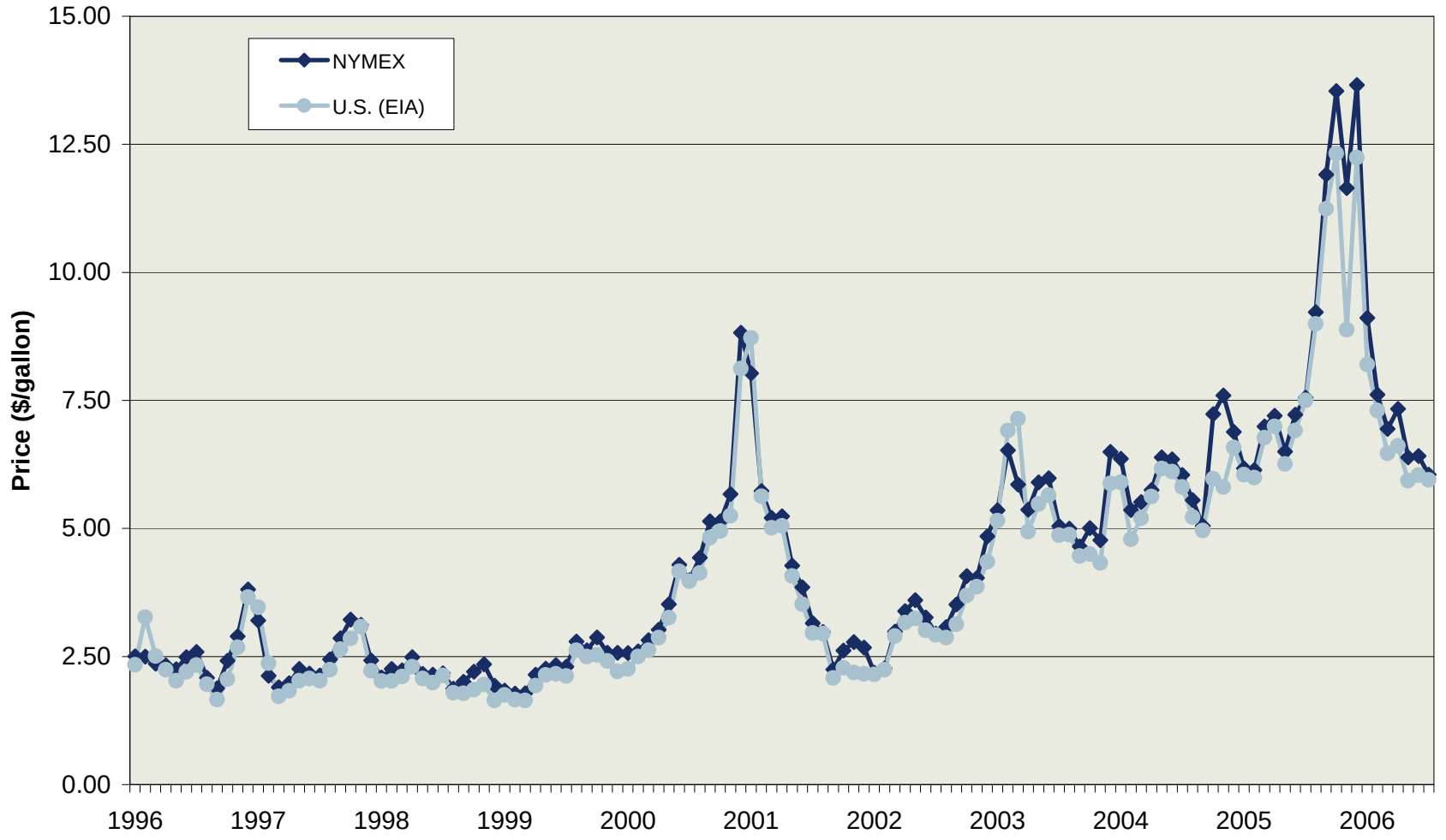
U. S. Monthly Natural Gas Prices, January 1996 - July 2006



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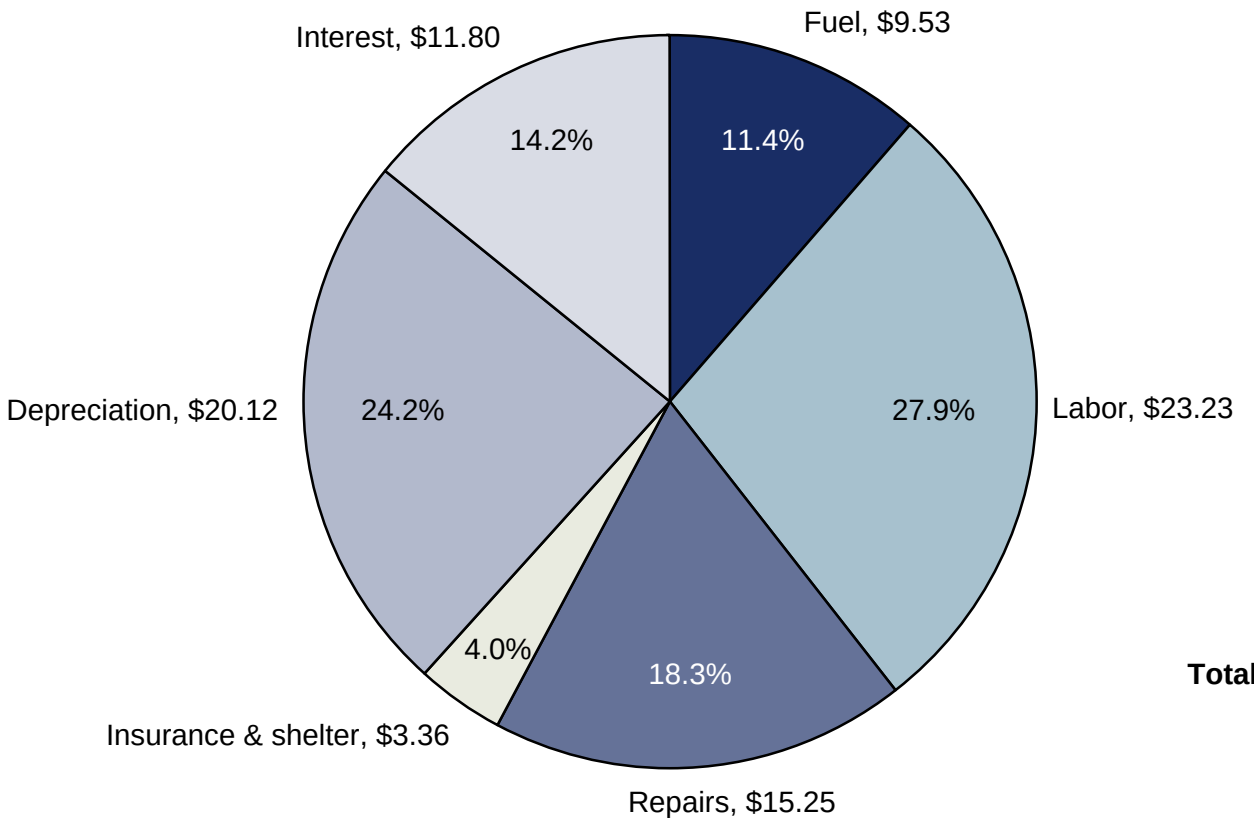


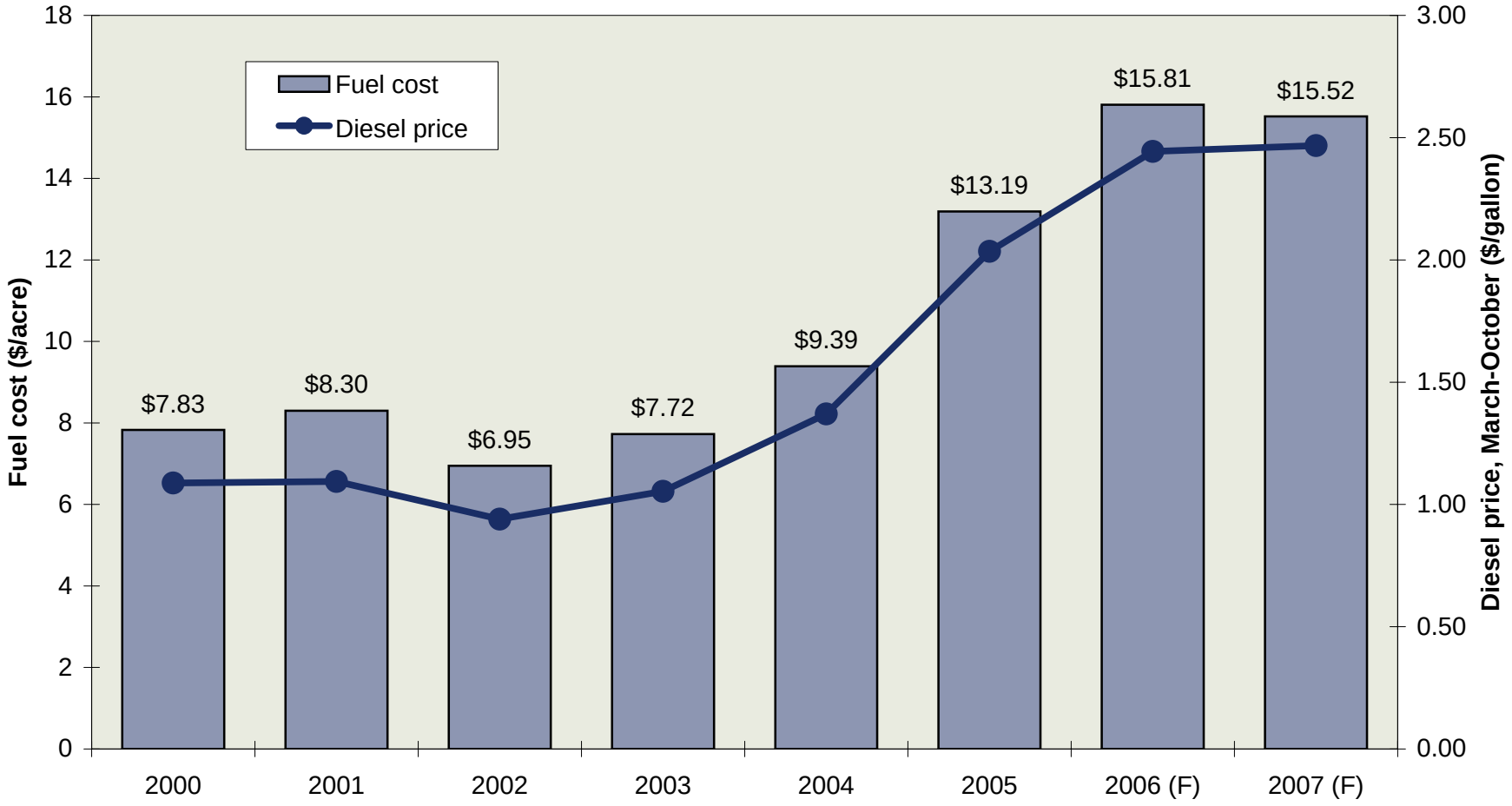
Total: $83.29

Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Fuel and Oil Costs for Irrigated Farms in Kansas Farm Management Association (KFMA), 2000-2007

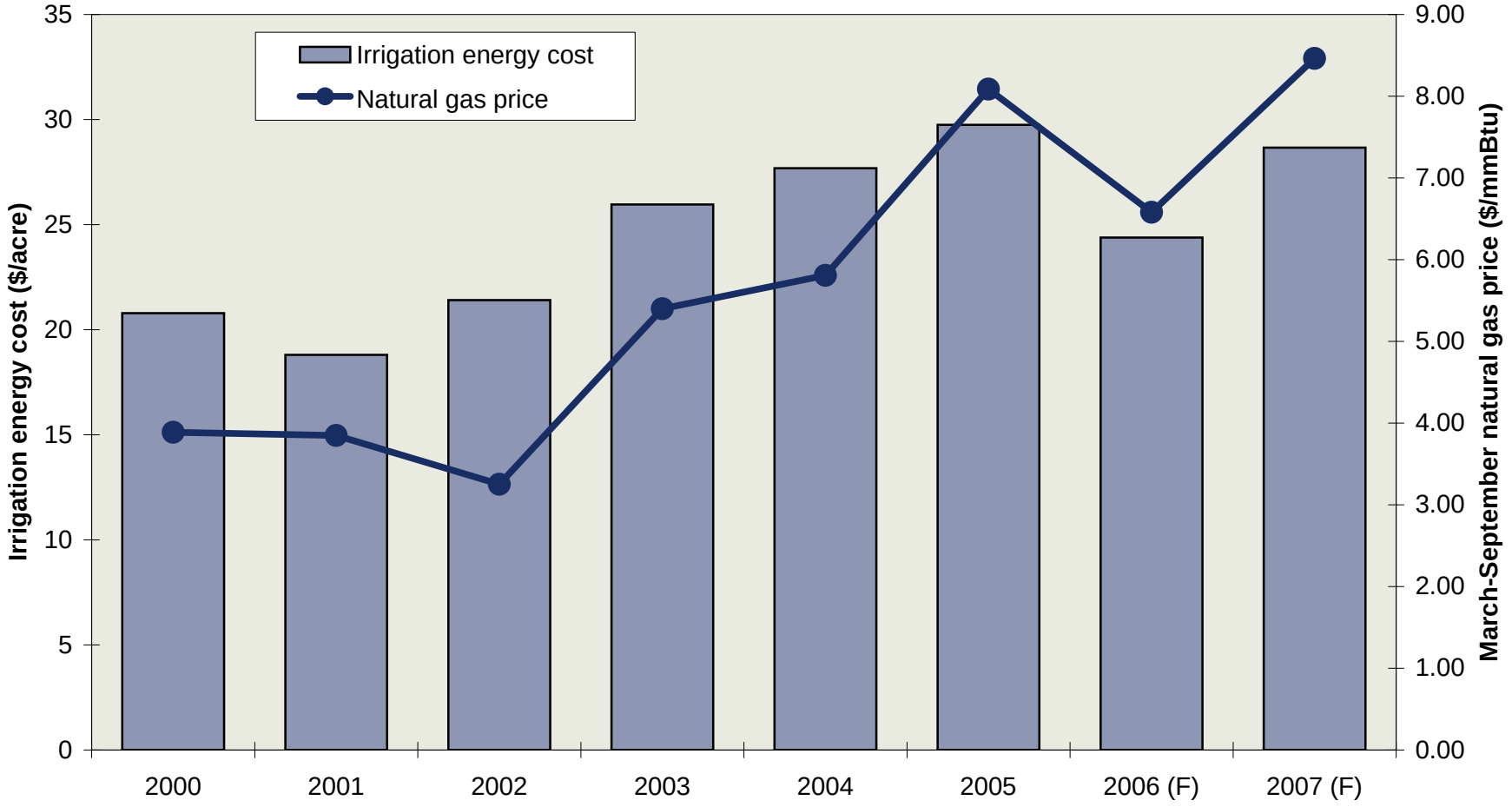
Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Fuel and Oil Costs for Non-irrigated Farms in Kansas Farm Management Association (KFMA), 2000-2007



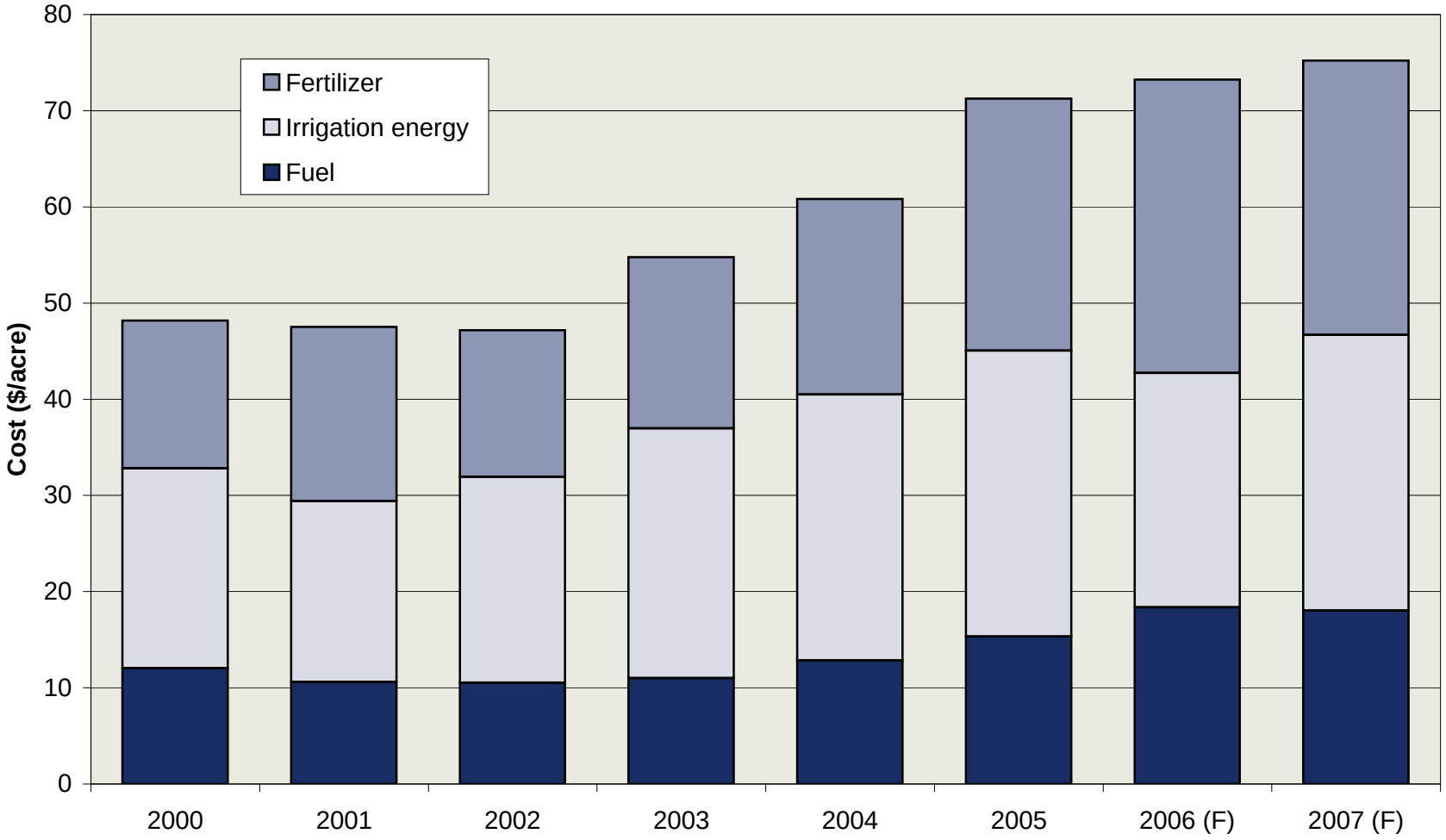
Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Irrigation Energy Costs for Irrigated Farms in Kansas Farm Management Association (KFMA), 2000-2007



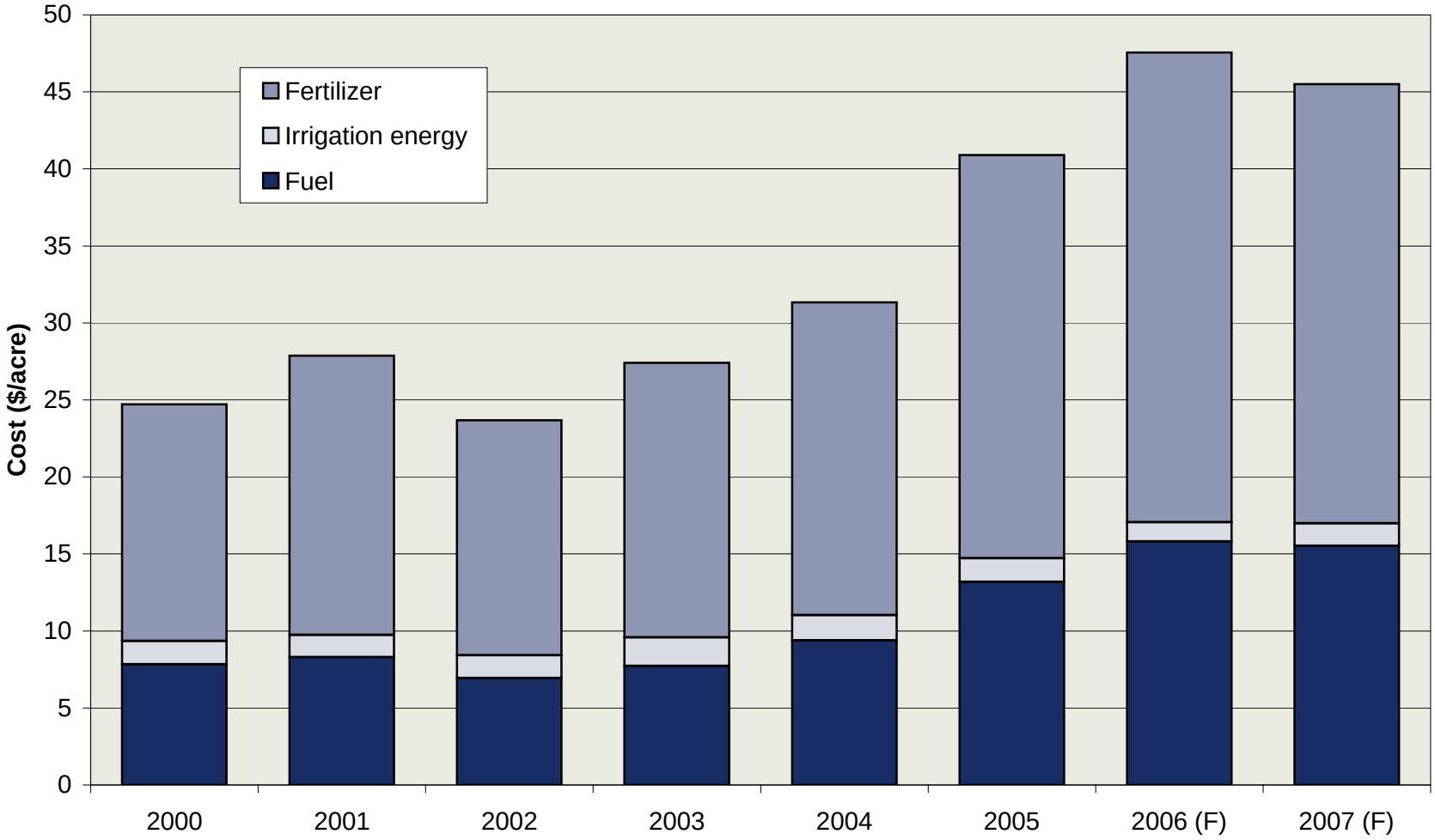
Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Energy-related Costs for Irrigated Farms in Kansas Farm Management Association (KFMA), 2000-2007



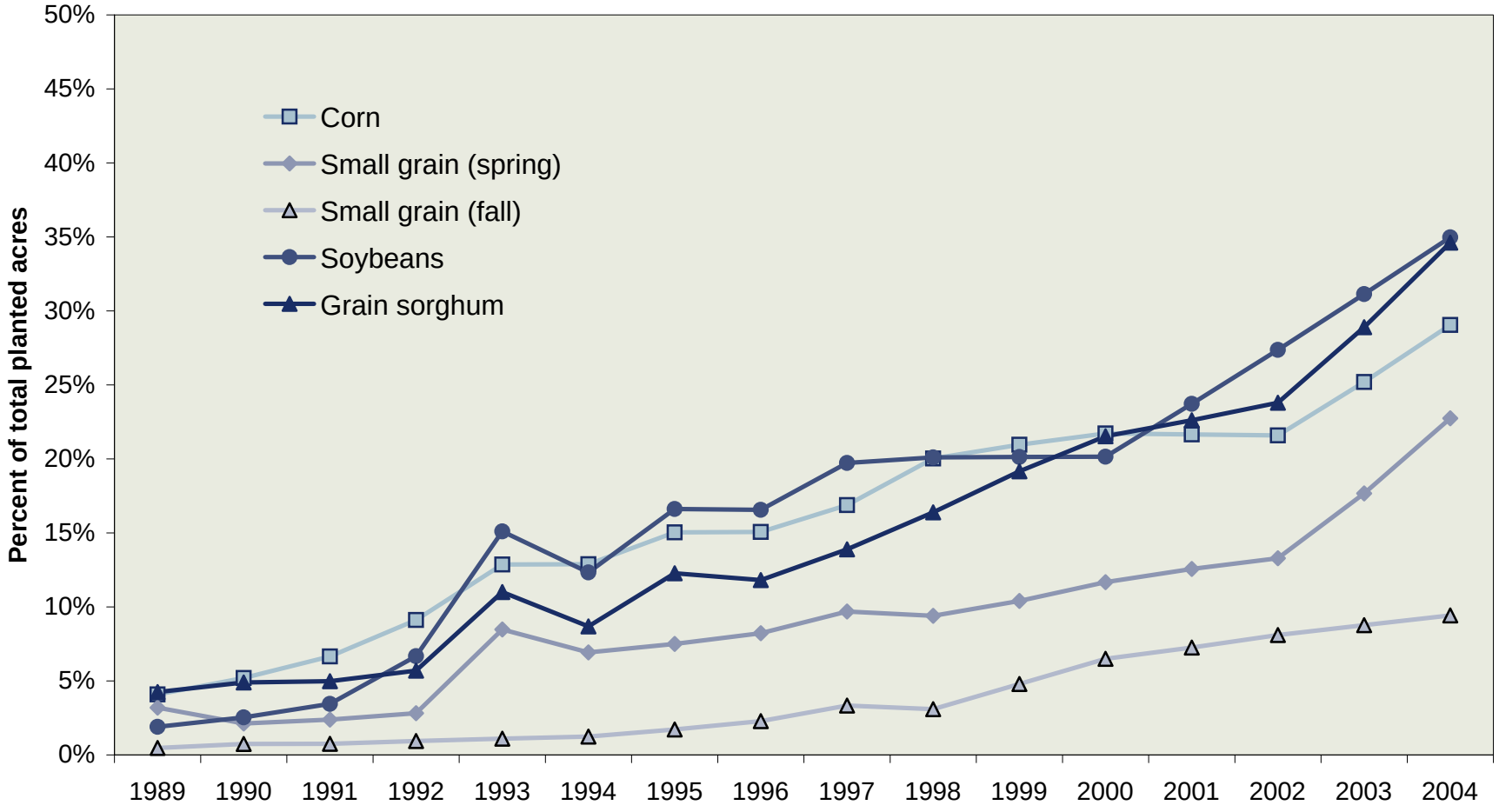
Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Energy-related Costs for Non-irrigated Farms in Kansas Farm Management Association (KFMA), 2000-2007



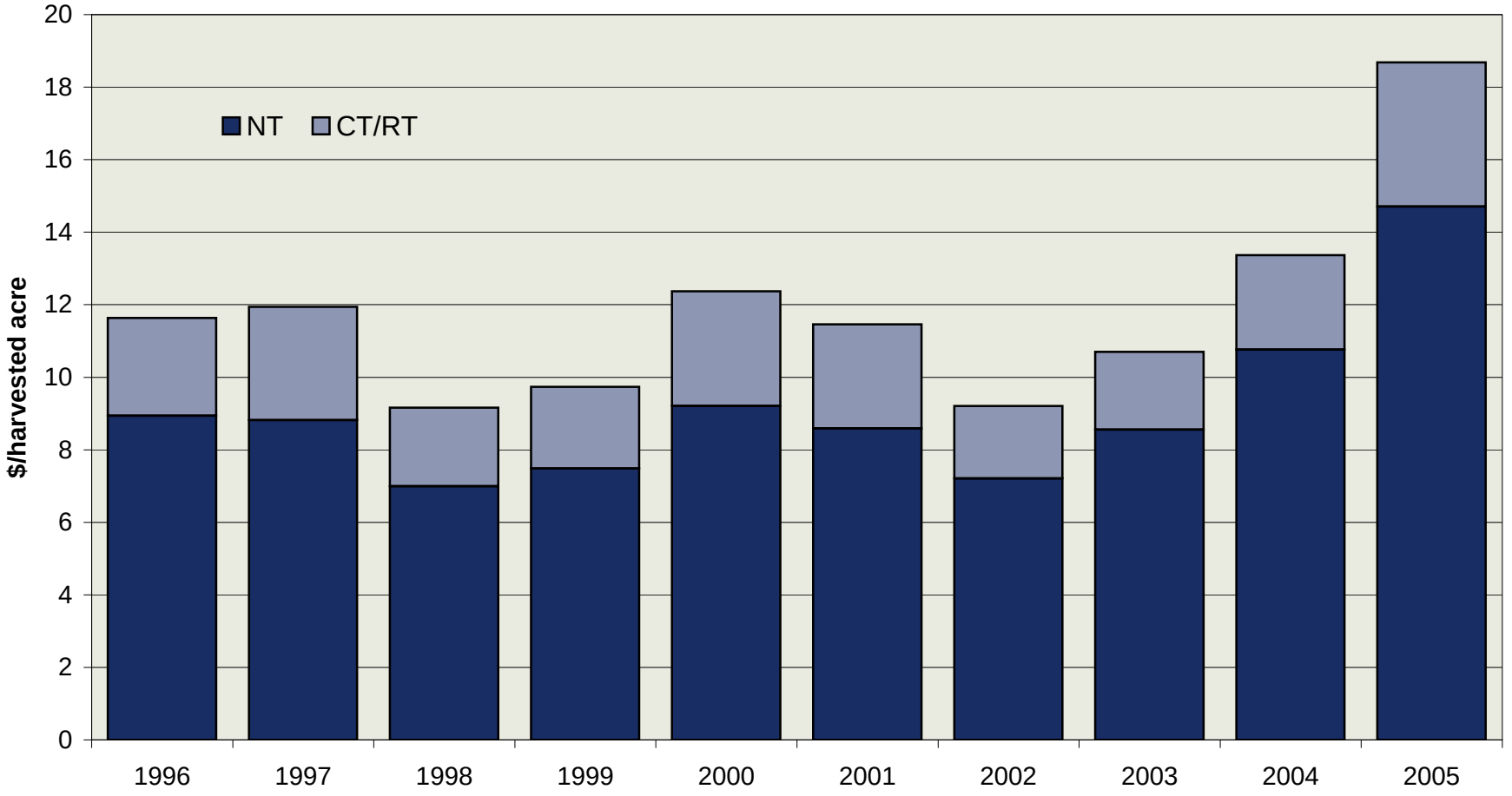
Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Percentage of Kansas Acres in No-till by Crop, 1989-2004



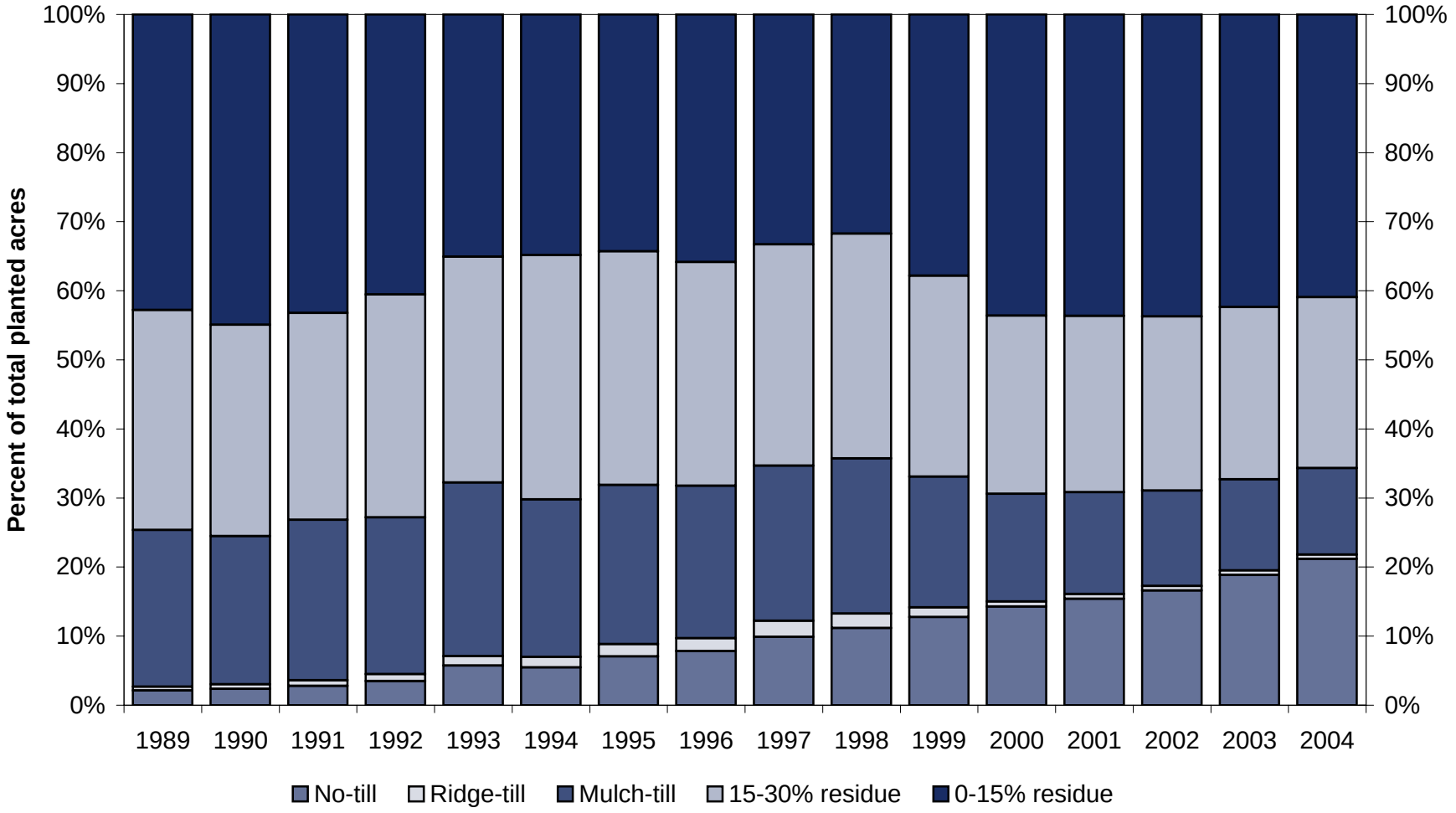
Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Comparison of Fuel and Oil Costs in North-central Kansas, 1996-2005
No-till vs. Conventional- and Reduced-till



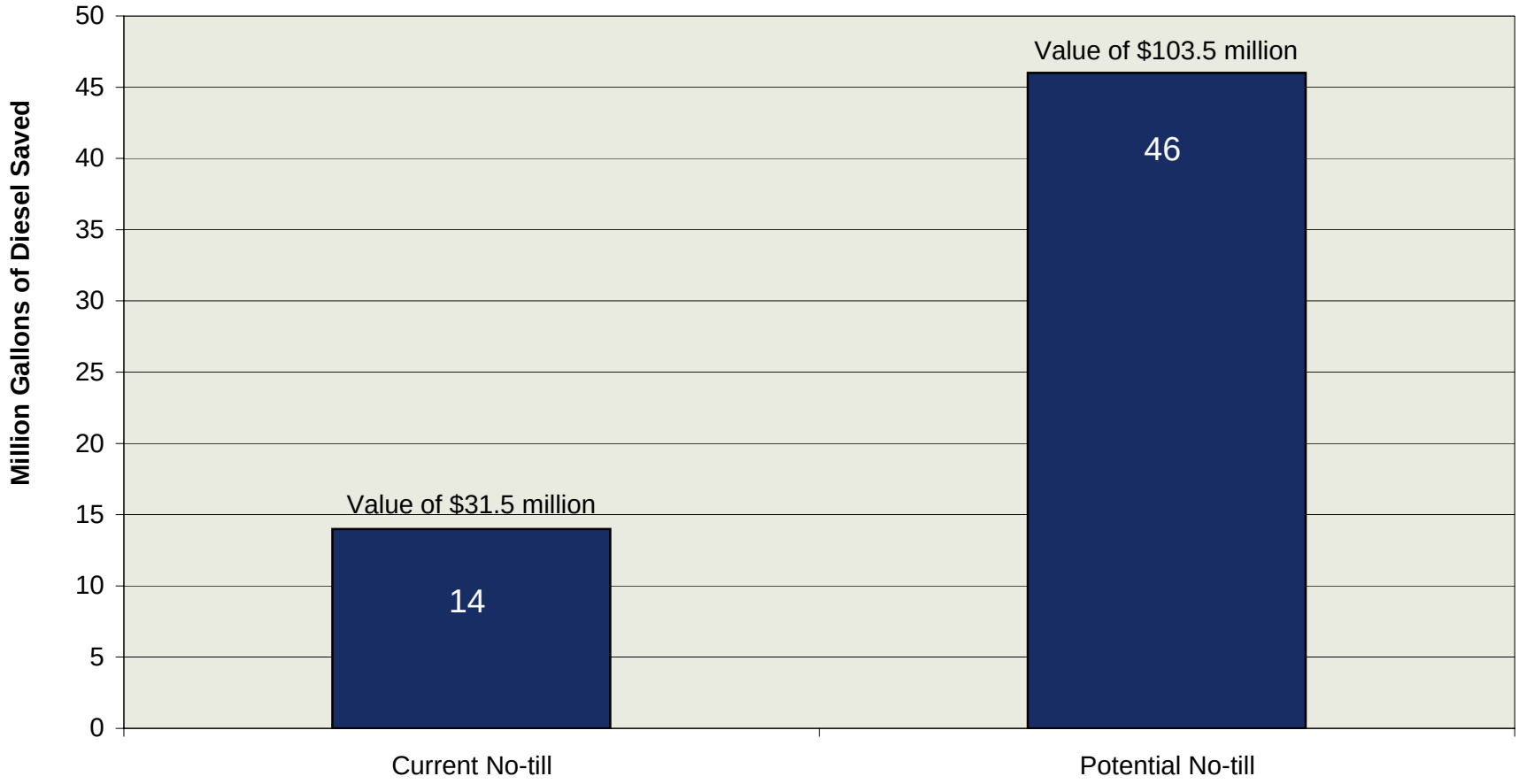
Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Agricultural Tillage Systems in Kansas, 1989-2004



Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

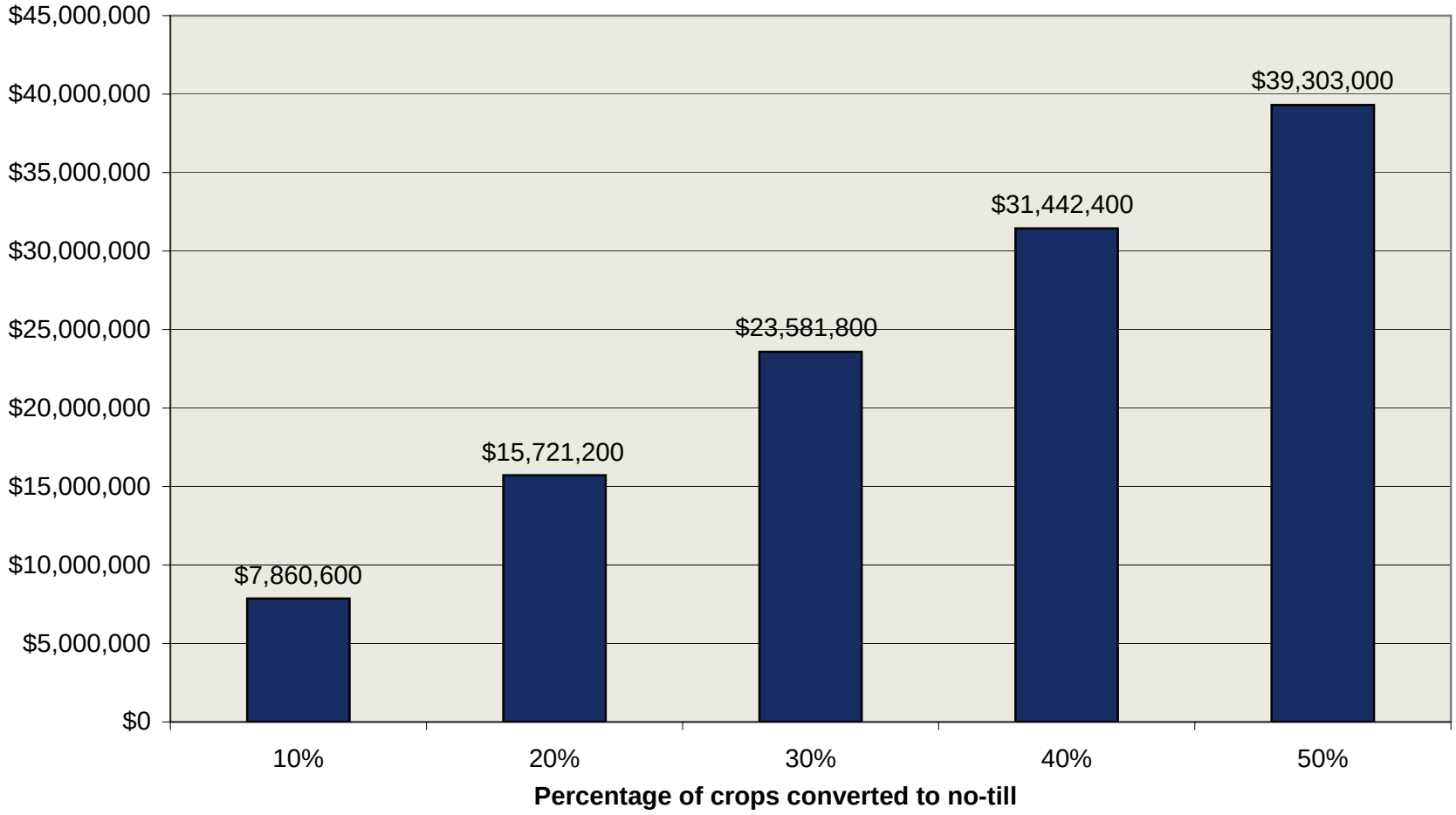
Projected Annual Fuel Savings from Conversion of All Kansas Crop Production to No-till
(assumes 2 gallons per acre savings and $2.25 diesel)



Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

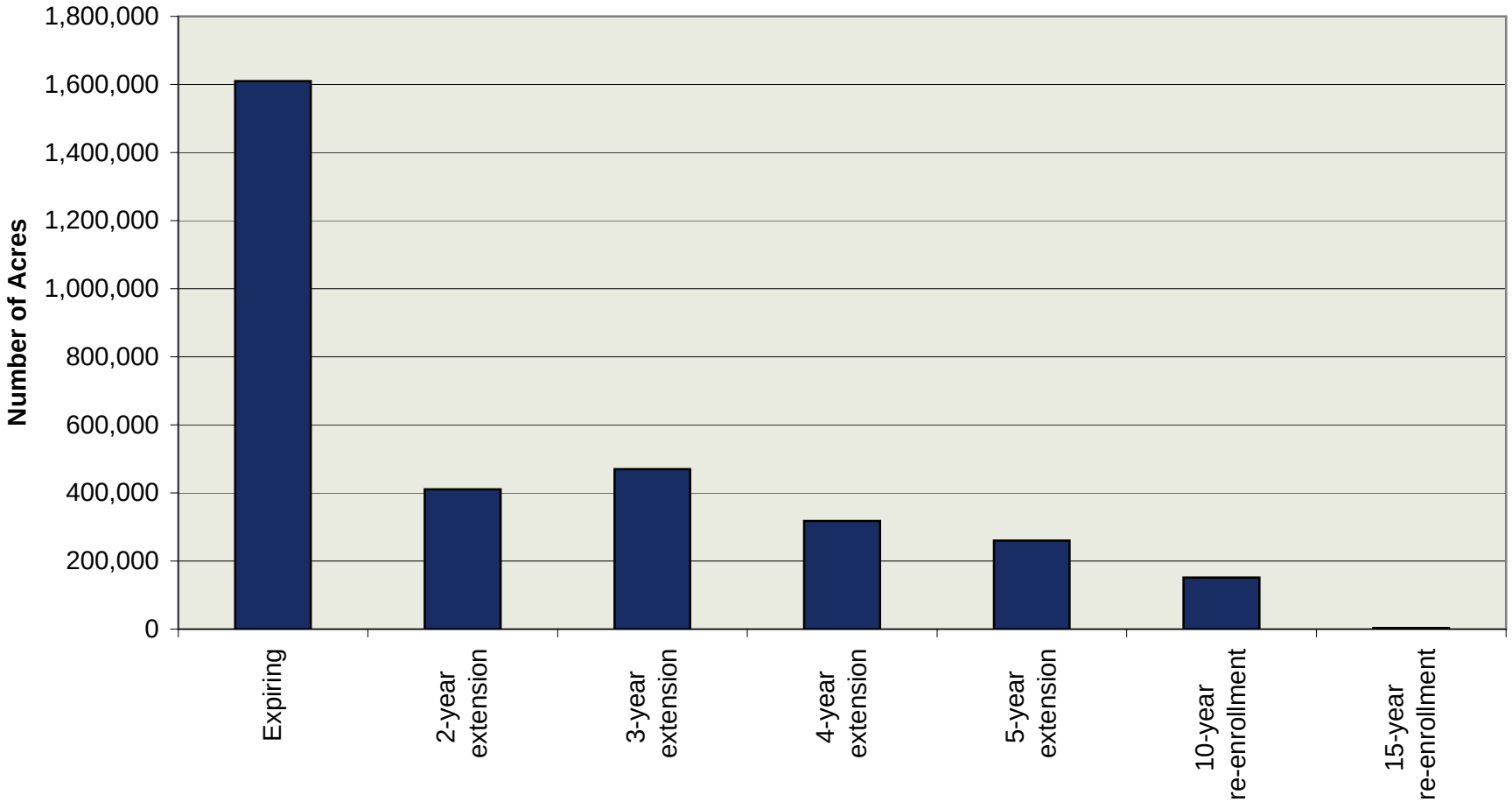
Projected Annual Dollar Savings from Conversion of Kansas Crop Production to No-till

(assumes 2 gallons per acre savings and $2.25 diesel prices)



Source: Kastens et al., Energy Use in the Kansas Agricultural Sector: Report Submitted to the Kansas Energy Council, June 15, 2006 (available on the KEC web site: http://kec.kansas.gov/).

Kansas Acres Scheduled to Come Out of Conservation Reserve Program (CRP), 2006-2007, and Extension and Re-enrollment Offers



Source: Baker & Lowe, Staff Analysis of KEC Background Report *Energy Use in the Kansas Agricultural Sector* , August 2006 (available on KEC web site http://kec.kansas.gov/).

Federal and State Resource Management Programs and Management Practices that Conserve Energy and Enhance Carbon Sequestration (1 = Improve Forage Quality, 2 = Prescribed Burning, 3 = Reduce Overgrazing, 4 = Buffer Strips, 5 = High Carbon Storage Crops, 6 = No-till and Reduced Till, 7 = Grass Plantings, 8 = Increase Cropping Intensity, 9 = Tree Plantings, 10 = Erosion Control, 11 = Cover Crops).

Agency	Program	Purpose	Energy Conservation and Carbon Sequestration Potential	Relevant Management Practices (see above)
Health and Environment	Nonpoint Source Pollution	Provides funds for projects that will reduce sources of nonpoint source pollution or that treat nonpoint source pollution before it reaches receiving water	Practices may reduce energy consumption through reduced water supply treatment needs. Projects may result in opportunities for C sequestration and provide multiple benefits	1 - 11
USDA/NRCS	Conservation Compliance	Requires specific treatment of highly erodible cropland and wetlands in order participate in most USDA programs	Practices may reduce energy consumption through reduced water supply treatment needs. Projects may result in C sequestration and provide multiple benefits. Watershed function improvement.	1 – 11
	Conservation Operations	Provides technical assistance on private lands for development and application of Resource Management Plans	Practices may reduce energy consumption through reduced water supply treatment needs. Projects may result in opportunities for C sequestration and provide multiple benefits.	1 - 11
	Environmental Quality Incentives Program	Offers financial and technical assistance to install structural and management practices	Practices may reduce energy consumption through reduced water supply treatment needs. Projects may result in C sequestration and provide multiple benefits. Watershed function improvement.	1 - 11
	Inventory and Monitoring	Provides information on soils, water and related resources. Conducts a national survey every fives years.	Assists in tracking and quantifying land uses and conversions	1 - 11
	Plant Materials Program	Assists with development of plant materials and techniques for their use in environmental improvement programs	Opportunities to develop high carbon sequestration potential plants.	1, 5, 7, 8, 9, 10, 11

Agency	Program	Purpose	Energy Conservation and Carbon Sequestration Potential	Relevant Management Practices (see above)
	Watershed Planning and Operations	Provides assistance to watershed or conservation districts to install treatment and structural practices	Practices may reduce energy consumption through reduced water supply treatment needs	4, 10
	Ground and Surface Water Conservation	Facilitates a conservation measure that results in a net savings in ground or surface water resources in the agricultural operation of a producer	Water conservation and energy use reduction	
	Wetlands Reserve Program	Cost share and easements to restore and protect wetlands	Reduces flood damage, filters pollutants, and reduces soil erosion, supplies wildlife habitat. Watershed function improvement and C sequestration	4, 7, 9, 10
	Wildlife Habitat Incentives Program	Cost share to establish wildlife habitat	Watershed function improvement and C sequestration	1, 3, 4, 7, 9, 10
	Grassland Reserve Program	Cost share and easements to protect, restore, and enhance native rangeland	Watershed function improvement and C sequestration	1, 2, 3, 7, 10
	Grazing Lands Conservation Initiative	Enhances the state's privately-owned grazing lands by increasing technical assistance at the grassroots level	Healthy grazing lands result in reduced runoff and nonpoint source pollution while sequestering carbon	1, 2, 3, 5, 7, 10
	Conservation Security Program	Contract payments for utilizing beneficial conservation practices. CSP is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life on Tribal and private working lands	Reduces soil erosion, improves water quality, water conservation. Watershed function improvement and C sequestration. Opportunities for energy use reduction.	1 – 11
	Conservation Reserve Enhancement Program	A voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water	Reduces energy use. Reduces soil erosion, improves water quality, water conservation. Watershed function improvement and C sequestration	1, 2, 3, 4, 7, 9, 10, 11

Agency	Program	Purpose	Energy Conservation and Carbon Sequestration Potential	Relevant Management Practices (see above)
	Farm and Ranchland Protection Program	Provides funding to keep farm and ranchlands in agricultural uses	Watershed function improvement and multiple C sequestration	1 - 11
	Energy Audits	Assessment of how energy is being consumed and suggestion on how reductions can be made and alternative energy produced	Energy use reduction and alternate energy sources	
Farm Services Agency	Conservation Reserve Program	Cost share and rental agreements to convert marginal cropland to native grasses and wetlands	Preserve the function of these systems and may enhance C sequestration. Energy conservation	1, 2, 3, 4, 7, 9, 10, 11
US Fish and Wildlife Service	Fish and Wildlife Enhancement Program	Supports field operations which includes technical assistance on protecting, restoring or maintaining native habitats	Preserves the function of these systems and may enhance C sequestration	1, 2, 3, 7, 9, 10, 11
	Private Lands Program	Contracts for 1 to 29 years to restore, enhance or create wetlands or native grasslands.	Preserves the function of these systems and may enhance C sequestration	1, 2, 3, 4, 7, 9, 10, 11
Wildlife and Parks	Conservation Easements for Riparian and Wetland Areas	Establishes easements to permanently secure and enhance quality areas in the state	Preserves the function of these systems and has potential for C sequestration	4, 7, 9, 10, 11
	Wildlife Habitat Improvement Program	Provides limited assistance for development of wildlife habitat	Watershed function improvement and C sequestration	1, 3, 4, 7, 9, 10
	North American Waterfowl Conservation Act	Provides up to 50% cost share for purchase and/or development of wetlands and wildlife habitat	Watershed function improvement and C sequestration	4, 7, 9, 10, 11
	Wildtrust	Accepts donated money, property and real estate to acquire and protect sensitive habitat	Watershed function improvement and C sequestration	2, 4, 7, 9, 10, 11
	MARSH Program	May provide up to 100% of funding for small wetland projects. Projects need to provide waterfowl benefits and be open to the public	Watershed function improvement and C sequestration	4, 7, 9, 10, 11

Agency	Program	Purpose	Energy Conservation and Carbon Sequestration Potential	Relevant Management Practices (see above)
State Conservation Commission	Water Resources Cost Share Program	Provides state financial assistance to landowners for the establishment of enduring water conservation practices to protect and improve the quality and quantity of Kansas Water Resources	Reduces soil erosion, improves water quality, water conservation. Watershed function improvement and C sequestration	1 – 11
	Nonpoint Source Pollution Control Fund	Provides state financial assistance for nonpoint source pollution control practices for the protection or restoration of surface and groundwater quality	Protects and/or restores surface and ground water quality. Watershed function improvement and C sequestration. Practices may reduce energy consumption through reduced water supply treatment needs.	1 – 11
	Riparian and Wetland Program	Addresses the conservation and management of riparian areas and wetlands.	Reduces flood damage, filters pollutants, reduces soil erosion, supplies wildlife habitat. Watershed function improvement and C sequestration	4, 7, 9 ,10
	Water Rights Purchase Program	Provides financial assistance to a local entity to purchase a water right to restore base flows in designated streams and/or slow or reverse the decline of groundwater levels in specific aquifers	Water and energy conservation	
	Water Quality Buffer Initiative	State cost share incentives supplement federal incentives to encourage the establishment of riparian forest buffers and vegetative filter strips.	Watershed function improvement and C sequestration	4, 7, 9, 10
Kansas Forest Service	Conservation Tree Planting Program	Provides low cost trees and shrubs for conservation plantings	Watershed function improvement and C sequestration	4, 9, 10
	Riparian and Wetland Program	Promotes and assists with establishment of riparian forest land and wetlands	Watershed function improvement and C sequestration	4, 7, 9, 10

Agency	Program	Purpose	Energy Conservation and Carbon Sequestration Potential	Relevant Management Practices (see above)
Kansas Rural Center	River Friendly Farms Program	Producers may qualify for a $250 incentive payment for completing the RFFP assessment and action plan. Upon Completion, producers may be eligible to apply for up to $5,000 in cost share funds	May identify opportunities for energy use reduction. Watershed function improvement and C sequestration	1 – 11
Kansas Alliance for Wetlands and Streams	Wetland and Riparian Program	Provides financial assistance for water education statewide. Financial and technical assistance for construction of streambank restoration and wetland projects.	Watershed function improvement and C sequestration	4, 7, 9, 10, 11